The Allen Consulting Group

# Review of the South Australian Solid Waste Levy

Final report

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Report to Zero Waste SA

The Allen Consulting Group

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# Acronyms and glossary

| | |
|---|---|
| ZWSA | Zero Waste SA |
| C&I | Commercial and industrial |
| C&D | Construction and demolition |
| MSW | Municipal solid waste |
| GHG | Greenhouse gasses |
| Levy | Solid Waste Levy |
| Strategy | South Australia's Waste Strategy 2011-15 |
| t | Tonnes |
| CPM | Carbon Price Mechanism |
| SA | South Australia |
| W2R EPP | Environment Protection (Waste to Resources) Policy |
| EPA | Environment Protection Agency |
| IF | Indexation factor |
| GFC | Global financial crisis |
| AWT | Alternative waste technologies |
| PC | Productivity Commission |
| $CO_2$-e | Carbon dioxide equivalent |

# Executive summary

The Solid Waste Levy (the Levy) is an important tool with which Zero Waste SA (ZWSA) pursues its objectives for waste minimisation and resource recovery in South Australia. The Levy is applied to each tonne of waste disposed as landfill and sends an important price signal throughout the community, while raising revenues to support complementary measures.

The 2010-11 South Australian Budget increased the Levy in 2011-2012 from $26 a tonne to $35 a tonne in Metropolitan Adelaide, and from $13 a tonne to $17.50 a tonne in regional areas. It is anticipated that the Levy will progressively increase beyond this to at least $50 a tonne in Metropolitan Adelaide to align it with similar levies in other Australian states.[1]

ZWSA is required by the *Zero Waste SA Act 2004* to periodically advise the Minister for Environment and Conservation on the scale of the Levy and how it should be applied. The Allen Consulting Group has been commissioned by ZWSA to review the impacts and structure of the Levy and assist ZWSA provide recommendations to the Government about the Levy for implementation in 2012-2013.

Recognising the wide range of impacts changes to the Levy may impose, this analysis has taken a triple bottom line approach to the evaluation and considered the market, environmental and social impacts. The key findings of this analysis are as follows.

- Depending on the scenario assumed, South Australia's diversion rate could increase to 79.2 per cent by 2014-15.
- Between 50 and 60 thousand *additional* tonnes of waste could be diverted away from landfill to the resource recovery processes each year.
- Increases in the Levy could contribute to the abatement of between 23 and 35 thousand tonnes of direct greenhouse gas emissions associated with landfill each year.[2]
- Increases in the Levy could generate an *additional* $7.7 million of revenues for the South Australian Government each year (under Scenario 1).
- Across the state, it is estimated that the proposed changes will have only a minimal impact on business, industry and household sectors.

While increases in the Levy can be expected to generate some considerable benefits, it is unlikely that all waste diversion targets set in *South Australia's Waste Strategy 2011-15*, will be achieved. The effectiveness of the Levy appears to be limited, particularly in the immediate term, and is likely to benefit from the support of additional complementary measures, including:

- education campaigns and information provision aimed in particular at households and small and medium enterprises;

[1] South Australian Government, 2010-11 Budget Paper No. 3.

[2] This figure does not include GHG savings resulting from a reduction in the use of virgin resources.

- incentives to encourage source separation in the commercial and industrial sectors; and
- support to promote on-site treatment of C&D waste.

### The benefits of resource recovery

When waste is sent to landfill, the residual economic value of waste products is disposed of and destroyed. Although treated and subjected to stringent environmental restrictions, landfill waste also generates greenhouse gas emissions, leachate and dis-amenity[3].

Resource recovery, on the other hand, salvages economic value from waste products and reinjects that value back into the economy. In doing so, resource recovery process generates significant economic and environmental benefits. Economic benefits from resource recovery include:

- creating new businesses, investment and employment[4] to transport, process, manufacture and redistribute the recovered resources;
- additional jobs being created due to the labour intensive nature of resource recovery;
- prolonging the useful life of landfill which frees up land that could provide a better economic return;
- increased productivity of businesses, through enhanced efficiency in relation to the use of materials; and
- the transfer of economic activity from jurisdictions that are engaged in developing virgin resources to SA.

Similarly, the environmental benefits of resource recovery relate to:

- conserving finite natural resources;
- reducing the environmental impacts and greenhouse gas emissions associated with the extraction and processing virgin resources; and
- reducing the environmental harm of waste to landfill.

### The Solid Waste Levy

Changes to waste policy and specifically, the Solid Waste Levy can have widespread implications on economic activity in SA. The majority of economic activity results in the production of some form of waste. As a consequence, all sectors of the economy are likely to be affected by such changes.

[3] Landfill sites in South Australia are regulated by the Environmental Protection Authority which requires management of leachate, odour, noise, pests and dust although this does not include greenhouse gas emissions

[4] Some practitioners do not consider resource recovery a wealth creating activity but rather it transfers investment and employment from one sector to another. Sustainable development practitioners argue that growth in the resource recovery industry is a desirable outcome as investment and employment is transferred to more sustainable industry sectors (that is, resource recovery). This in turn, helps facilitate the transition to a more sustainable economy as it prolongs the useful life of finite resources.

The general concept of a waste levy on landfill is to promote resource recovery by increasing the relative cost of landfill. Increasing the cost of sending waste to landfill provides an incentive to reduce the amount of waste sent to landfill and allows other mechanisms to manage waste to become more competitive and financially viable. However, for this to occur requires behavioural change amongst the generators of waste products, including households, businesses and industry.

Of particular importance to the review is how the Levy will interact with the Commonwealth Government's Carbon Price Mechanism (CPM). Many of SA's landfill operators will be liable under the CPM which will come into effect as of July 1, 2012. The effects of the CPM has been explicitly incorporated in the modelling (see Box ES1.1). The CPM will impose a charge on waste to landfill that will apply in *addition* to the Solid Waste Levy. The analysis has incorporated the CPM into the baseline, such that all figures reported only reflect the specific impacts of the Levy.

Box ES 1.1

**LANDFILL AND THE CARBON PRICE MECHANISM**

The *Clean Energy Future Act, 2011* set a carbon price for Australian businesses of $23 per tonne from 1 July 2012, rising 2.5 per cent in real terms per year until 2014-15 (Commonwealth of Australia, 2011c). Under the CPM, landfill sites with historical emissions equivalent to 25,000 tonnes of carbon dioxide or greater in one year will be required to pay for the greenhouse gas emissions from their landfill.

It is anticipated that gate fees will increase as the cost of the CPM is passed forward to customers. Estimates of the amount of carbon per tonne of waste and their cost implications are outlined in Table ES 1.1.

Table ES 1.1

**ADDITIONAL COSTS ASSOCIATED WITH A CARBON PRICE, 2011**

| | MSW | C&I | C&D |
|---|---|---|---|
| Gross emissions per tonne of landfill, $CO_2$-e/t | 1.19 | 1.08 | 0.17 |
| Emissions liable under CPM, per cent | 60 | 60 | 60 |
| Net emissions per tonne of landfill, $CO_2$-e/t | 0.71 | 0.65 | 0.10 |
| Carbon Price, $/t | 23 | 23 | 23 |
| Landfill, per cent | 30 | 43 | 27 |
| ***Average CPM cost for SA Waste sector $/t landfill*** | | | ***11.97*** |

*The average cost had been adjusted based on the net amount of liable landfill emissions, recognising the effects of capping. It also includes the effect of landfill methane loss and the methane released before waste emissions are capped.
Source: Stakeholder consultations, ZWSA and Allen Consulting Group analysis.

It is estimated that in 2014-15, the CPM will raise about $12.5 million for the Commonwealth Government.

The introduction of the CPM will lead to higher diversion rates of waste to landfill in its own right. This analysis focuses on the change in volumes of waste sent to landfill, which are a result of Levy changes. The effect of the CPM has been examined in the baseline case and therefore throughout all the assessed scenarios.

Source: The Allen Consulting Group.

## Proposed changes to the Levy

Variances in the way the Levy is applied, including incentives provided in its implementation, will differ in their impact on the waste management in the State. Four different Scenarios were developed by ZWSA to be assessed in this review. Each Scenario contains differences in the Levy or other influential changes as outlined in the table below.

It should be noted that the focus of this analysis is on the impact of the proposed changes to the Levy as defined above. In the business-as-usual case, the Levy increases by the Department of Treasury and Finance's Indexation Factor of 3.1 per cent. This increase, combined with the impacts of the CPM, will affect baseline landfill, diversion and resource recovery. All impacts reported here reflect the impacts that occur *in addition* to baseline changes.

Table ES 1.2

**SCENARIOS ASSESSED**

| Scenario | Description |
|---|---|
| Baseline case | Maintain the current Levy and increase with CPI. |
| Scenario 1 | Scenario 1 assesses the impacts of a step increase in the Levy across all sectors in 2013-14. |
| Scenario 2 | This Scenario involves assessing the impact of applying a differential levy by waste sector. The Levy paid by MSW is not increased. |
| Scenario 3 | A differential Levy applied on the basis of location. Scenario 3 exempts regional areas from the Levy increase. |
| Scenario 4* | This Scenario involves Levy changes identical to that of Scenario 1, but includes a change in how the Levy is administered. Under this scenario, transfer stations would be required to collect a levy on all waste received. A rebate for recycling and recovery (actual sales) would then be provided. |

* Note: The impacts of this Scenario are not expected to be materially different to from Scenario 1, as the two Scenarios have the same associated Levy changes. Consequently, the modelling results of this Scenario are not reported in the subsequent chapters, but are instead discussed qualitatively where they differ from the results of Scenario 1.
Source: The Allen Consulting Group.

Table ES 1.3

**SCENARIO LEVY RATES, 2013-14**

| Scenario | Value of Levy in 2013-14, $ | | | | | |
|---|---|---|---|---|---|---|
| | Metropolitan Adelaide | | | Non-metropolitan Adelaide | | |
| | MSW | C&I | C&D | MSW | C&I | C&D |
| Baseline case | 37.3 | 37.3 | 37.3 | 18.7 | 18.7 | 18.7 |
| Scenario 1 | 50.0 | 50.0 | 50.0 | 25.0 | 25.0 | 25.0 |
| Scenario 2 | 37.3 | 50.0 | 50.0 | 18.7 | 25.0 | 25.0 |
| Scenario 3 | 50.0 | 50.0 | 50.0 | 18.7 | 18.7 | 18.7 |

Note: Levy rates in the baseline case have been adjusted by the Department of Treasury and Finance's Indexation Factor of 3.1 per cent.
Source: The Allen Consulting Group.

## Market impacts

The principal market shift of the Levy changes is a move away from waste to landfill to the resource recovery process. Resource recovery increases (waste to landfill decreases) under each of the Scenarios assessed (as seen in Table ES 1.4 and Table ES 1.5). Changes to the Levy have the potential to result in the salvaging of between 50 to 60 thousand tonnes in 2014-15 of valuable economic resources that would otherwise be disposed of.

Scenario 1 has the greatest impact on the volume of resource recovery, increasing by nearly 1.9 per cent. Under this Scenario, the Levy increases are the most consistent across all sectors and regions.

Resource recovery increases in the other Scenarios, but to a lesser extent Scenario 2 has the lowest impact on the amount of waste sent to resource recovery, increasing it by 1.6 per cent. This is a result of a significant proportion of landfill (MSW- which makes up 30 per cent of landfill) not being subject to any increases in the Levy, relative to the baseline case.

A range of other market impacts may also result from increased resource recovery. It is estimated, for example, that between 300 and 400 additional jobs could be created as a result of changes to the Levy[5]. It is noted that these employment opportunities however, might not be feasible in the immediate term. Rather they are a reflection of what may happen in the longer term as the waste industry adjusts to the levy changes.

Table ES 1.4

**RESOURCE RECOVERY, DEVIATION FROM BASELINE ('000 TONNES)**

| Scenario | 2013-14 | | | 2014-15 | | |
|---|---|---|---|---|---|---|
| | Deviation from baseline '000 tonnes | Deviation from baseline per cent | Diversion rate per cent | Deviation from baseline '000 tonnes | Deviation from baseline per cent | Diversion rate per cent |
| Scenario 1 | 56.8 | 1.9 | 78.9 | 59.6 | 1.9 | 79.2 |
| Scenario 2 | 47.8 | 1.6 | 78.7 | 50.2 | 1.6 | 78.9 |
| Scenario 3 | 52.6 | 1.7 | 78.8 | 55.4 | 1.8 | 79.1 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

[5] This has been estimated based on information contained in the National Waste Report 2010 (see DEWHA 2010).

Table ES 1.5

**RESOURCE RECOVERY AND DIVERSION BY SECTOR, 2014-15**

| Sector | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|
| | Resource recovery per cent deviation from baseline | Diversion rate per cent | Resource recovery per cent deviation from baseline | Diversion rate per cent | Resource recovery per cent deviation from baseline | Diversion rate per cent |
| MSW | 2.3 | 59.5 | 0.0 | 58.2 | 2.0 | 59.3 |
| C&I | 2.3 | 63.5 | 2.3 | 63.5 | 2.0 | 63.3 |
| C&D | 1.7 | 93.8 | 1.7 | 93.8 | 1.7 | 93.8 |
| Total | 1.9 | 79.2 | 1.6 | 78.9 | 1.8 | 79.1 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

## Environmental impacts

By diverting waste away from landfill, increases in the Levy are able to achieve considerable environmental benefits. This includes increased resource recovery, increased diversion rates, reductions in greenhouse gas emissions, as well as other environmental impacts.

The key environmental impact of the Levy changes are an increase of between 50 and 60 thousand additional tonnes of waste diverted away from landfill to resource recovery processes each year, as discussed above.

Table ES 1.6 outlines the potential reduction in GHG emissions associated with sending waste to landfill under each Scenario. Increases in the Levy could reduce GHG emissions by around 30 thousand tonnes each year (Scenario 1). This quantum again decreases as more leakage/exemptions are applied to the Levy, as occurs under the other Scenarios.

Table ES 1.6

**LANDFILL GHG ABATEMENT, DEVIATION FROM BASELINE ('000 TONNES)**

| Scenario | 2013-14 | 2014-15 |
|---|---|---|
| Scenario 1 | 33.2 | 34.8 |
| Scenario 2 | 22.6 | 23.6 |
| Scenario 3 | 28.5 | 30.0 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

A range of other externalities are also associated with sending waste to landfill. For example, transport externalities that are associated with trucks that collect waste cause noise, contribute to congestion and air pollution and increase the risk of accidents. Similarly, as mentioned above, there are also indirect benefits that accrue from avoided mining and other processing of virgin resources to replace disposed materials. Although significant in their own right, these impacts have not been quantified in this analysis.

### Social impacts

The South Australian Government stands to the gain considerable revenues from the Levy increase. Changes to the Levy will impact on the ability of the SA Government to meet its identified targets for the reduction of waste.

Under all Scenarios assessed the South Australian Government receives increased revenue as a result of Levy changes. The amount of additional revenue generated under each Scenario ranges from $4.5 million under Scenario 2 (bringing the total revenue to $35.7 million) to $7.7 million under Scenario 1 (which would bring the total revenue received to $38.8 million).

Any increase in the Levy will impose increased costs on the generators of waste — affecting industry, businesses and households. The extent to which each sector will be affected will differ depending on whether that sector observes the price signal directly (as in the case of industry) or indirectly as in the case of households. The impacts on business, local government and the household sector are discussed below.

- ***Commercial and industry*** — During consultations it was noted that organisations, particularly large businesses and industry, are facing increased costs in the current operating environment. Within this context it was noted that business and industry were working hard to minimise costs associated with waste. It was further suggested that increases in the levy would not generate a significant response from this sector to have a material impact on diversion levels.

  Under all Scenarios businesses face increased costs associated with Levy changes. However, businesses, on average do not face significant increases, with the additional annual cost per business estimated to range from $76.10 (under Scenario 3) to $86.70 under Scenario 1.

- ***Local Government*** **—** Local Governments spend a significant proportion of their funds on waste and related activities. The 68 Councils in SA spend around $1 billion a year, with waste and recycling in particular making up 10 per cent of total council expenditure (Local Government Association of South Australia 2007). The impact of Levy changes are based on increased costs associated with the increased Levy amounts charged for MSW going to landfill. This is mitigated to some extent by increased diversion; however the net impact is an increase in costs to this sector.

The Levy presents a significant cost to the Local Government sector, (for example, under Scenario 1, the total cost for Local Government will be approximately $13.5 million), which can some extent be mitigated by increased diversion rates. Scenario 1 has the greatest impact on Local Government, followed by Scenario 3, with increased costs of $3.1 million and $2.8 million respectively in 2014-15. Scenario 2 has no economic impact relative to the baseline, reflecting the fact that the Levy amount is the same for MSW.

- ***Households*** — Since households generate waste in the form of MSW, increases in the Levy will increase the costs of generating waste for households. However, Local Government is responsible for the collection and disposal of waste and hence pays the Levy. This means that increases in the Levy will not directly increase costs for households. Households will be affected by Levy changes if Local Governments pass the increases on by increasing rates.

  In 2014-15, Scenarios 1 and 3 increase the cost of disposing of waste for households relative to the baseline case by $4.40 and $4.00 per household, respectively. Scenario 2 has no impact reflecting the fact that under this Scenario there are no increases in the Levy applicable to MSW.

### Summary of impacts

Increases in the Levy result in various economic, environmental and social costs and benefits. A summary of these is outlined in Table ES 1.7.

Under all Scenarios, the economic costs of diverting waste to resource recovery outweigh the economic benefits of diverting waste from landfill. While to some extent this is negated by the quantifiable environmental benefits, under all Scenarios the Levy changes led to a net economic cost.

Table ES 1.7

**SUMMARY OF IMPACTS, 2014-15**

| Impact | Units | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| Market impacts | | | | |
| Net economic impact* | $ millions | -0.24 | -0.53 | -0.35 |
| *—Cost of increased resource recovery* | *$ millions* | *9.05* | *7.63* | *8.41* |
| *—Savings on reduced landfill* | *$ millions* | *7.82* | *6.38* | *7.18* |
| *—Avoided environmental externalities caused by landfill*** | *$ millions* | *0.99* | *0.72* | *0.87* |
| Change in waste sector employment | Persons | 375 | 317 | 349 |
| Environmental impacts | | | | |
| Additional tonnes of waste diverted to resource recovery | 1000 tonnes | 59.6 | 50.2 | 55.4 |
| Avoided landfill GHG emissions | 1000 tonnes | 34.8 | 23.6 | 30.0 |
| Diversion rate | Per cent | 79.2 | 78.9 | 79.1 |
| Change in diversion rate (relative to baseline) | Percentage points | 1.5 | 1.3 | 1.4 |
| Social impacts | | | | |
| Increase in Local Government costs | $ millions | 3.1 | 0.0 | 2.8 |
| Average increase in business costs | $ per business | 86.7 | 86.6 | 76.1 |
| Households | $ per household | 4.4 | 0.0 | 4.0 |
| Revenue impacts | | | | |
| Total SA Government revenue raised from Levy | $ millions | 38.8 | 35.7 | 38.0 |
| *—Change in SA Government revenue* | *$ millions* | *7.7* | *4.5* | *6.8* |
| Total Commonwealth Government revenue raised from CPM and landfill | $ millions | 12.2 | 12.4 | 12.3 |
| *— Change in Commonwealth CPM revenue* | *$ millions* | *na* | *na* | *na* |

*This has been calculated as the total quantified benefits minus total quantified costs.
*This includes the economic cost of dis-amenity, leachate and GHG as estimated in the literature.
Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

*Chapter 1*

# This report

In 2004, the South Australian (SA) Government established Zero Waste South Australia (ZWSA) and the *Zero Waste SA Act 2004* to enable State and Local Government to work together to drive a new strategy for waste avoidance and reduction, waste reuse and recycling and waste disposal. ZWSA was created to reduce the reliance of waste management in SA on landfill and advance the development of resource recovery.

ZWSA is responsible for target 67 in South Australia's Strategic Plan—*In a great state*, which requires a 35 per cent reduction of waste to landfill by 2020 with a 25 per cent reduction by 2014 (from a 2002-03 base year) (Government of South Australia, 2011). ZWSA performs a variety of functions, which are outlined in Box 1.1.

Box 1.1

**FUNCTIONS OF ZERO WASTE SA**

The functions of Zero Waste SA:

(a) to develop, co-ordinate and contribute to the implementation of government policy objectives in respect of —

- (i) waste management for regions, industry sectors or material types;
- (ii) public and industry awareness and education in relation to waste management;
- (iii) programs for the prevention of litter and illegal dumping;
- (iv) market development for recovered resources and recycled material;

(b) to develop, adopt and administer the waste strategy for the State; and

(c) to monitor and assess the adequacy of the waste strategy and its implementation; and

(d) to provide assistance to local councils with arrangements for regional waste management; and

(e) to contribute to the development of waste management infrastructure, technologies and systems; and

(f) to commission, support and collaborate on research into waste management practices and issues; and

(g) to advise the Minister from time to time about the amount to be charged by way of the Levy under section 113 of the Environment Protection Act 1993; and

(h) to advise the Minister about any matter referred to it by the Minister or any matter it sees fit to advise the Minister on in connection with its responsibilities under this Act; and

(i) such other functions as may be conferred on it by this Act or any other Act, or as may be assigned to it by the Minister.

Source: Zero Waste SA Act 2004, p. 4.

In combination with a number of policies and programs, the Solid Waste Levy (the Levy) is an important instrument with which ZWSA pursues its objectives. The Levy is applied to each tonne of waste disposed as landfill.

The *Zero Waste SA Act 2004* requires ZWSA to advise the Minister for Environment and Conservation from time to time about the amount to be charged by way of the Levy under the *Environment Protection Act 1993*. The Allen Consulting Group has been commissioned by ZWSA to assist with this process and undertake a review of the Levy. The study's Terms of Reference are provided in Appendix A.

The remainder of this report is structured as follows.

- Chapter 2 examines waste management and resource recovery in South Australia.
- Chapter 3 outlines the approach used to assess the proposed changes to the Solid Waste Levy.
- Chapter 4 explores the market impacts of the various Scenarios.
- Chapter 5 discusses the environmental impacts of each Scenario.
- Chapter 6 assesses the social impacts of each Scenario.
- Chapter 7 provides a holistic discussion of the changes to the Levy and draws conclusions.

The analysis contained in this report draws heavily on input gained from a range of relevant stakeholders. Both face-to-face and telephone consultations have been used to gain important insights into the impacts of Levy changes. In addition, two focus group discussions were held with Waste Management of Association of Australia's members and Local Government representatives in Adelaide.

Consultations were held over a number of weeks in June and July 2011. A complete list of consultations undertaken is provided in Appendix B.

*Chapter 2*

# Waste management in South Australia

Waste generation is an unavoidable by-product of a buoyant and prosperous economy. It is generated by all sectors of the economy and at each point in the production chain.

The disposal and treatment of waste however reflects a significant environmental challenge for the State, as well as local communities. Significant cost externalities — including leachate, dis-amenity and greenhouse gas (GHG) emissions — are produced with landfill deposits.

Furthermore, the disposal of waste can be synonymous with the disposal of valuable economic resources. The technology exists to recover or make use of metals, plastics, green-waste and other waste products — which eliminates the need to reproduce these from virgin sources.

Like food, water and shelter — waste also has an important social dimension. It is important that waste disposal remains affordable and universal.

This chapter outlines the extent and nature of waste generation and disposal in SA.

## 2.1 Waste generation in South Australia

In 2010, South Australian industry and households generated nearly 3.8 million tonnes of waste.

The sources of waste are categorised into three broad sectors. These being Municipal Solid Waste (MSW), Construction and Demolition (C&D) and Commercial and Industrial (C&I). Table 2.1 provides a brief description of each of these three sectors.

Table 2.1

**SOURCES OF WASTE**

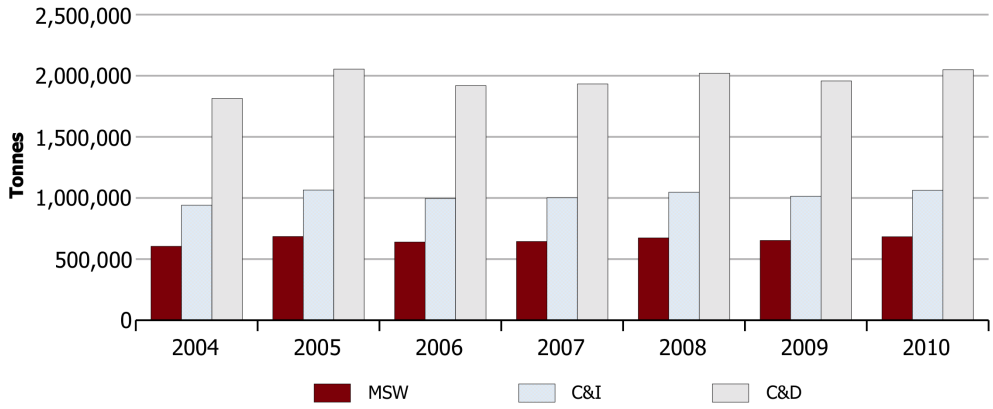
| Source | Description |
|---|---|
| MSW | Covers waste produced in homes and businesses that is not a liquid or gas. MSW is collected by local councils in the wheelie bins put out in front of homes and businesses, as well as through dedicated MSW-Hard Waste collections. |
| C&I | Covers the solid component of the waste stream arising from commercial, industrial, government, public or domestic premises (not collected as MSW), but does not contain listen waste, hazardous waste or radioactive waste. |
| C&D | Covers the solid inert component of the waste stream arising from the construction, demolition or refurbishment of buildings or infrastructure but does not contain MSW, C&I, listed waste, hazardous waste or radioactive waste. |

Source: EPA 2009, p. 2-3

The level of waste generation for MSW, C&I and C&D in SA from 2004-2010 is outlined in Figure 2.1. It shows that the level of waste generated for all three sectors over seven years have remained fairly constant. Between 2004 and 2010 the C&D sector generated the largest amount of waste, while the MSW sector generated the least.

Figure 2.1

**WASTE GENERATION, 2004-2010**




Source: The Allen Consulting Group

## 2.2 Waste management

Waste is generally disposed of by one of two methods. Waste can be sent to landfill or can be used in resource recovery.

In 2010, approximately one million tonnes of waste was sent to landfill. C&I contributed an estimated 43 per cent (445 thousand tonnes) while MSW contributed an estimated 30 per cent (311 thousand tonnes) of waste sent to landfill. C&D is estimated to have accounted for the remaining 27 per cent of waste sent to landfill (279 thousand tonnes) (DEWHA 2010).

When feasible, the 'preferred' destination for waste is resource recovery. Resource recovery:

- reduces many of the environmental costs associated with waste to landfill;
- retains the value of economic resources that would otherwise be lost; and
- has the potential to move economic activity from jurisdictions with virgin resource operations to SA.

Certainly, governments at all levels have introduced policy measures attempting to maximise the resource recovery process. In SA, *the 2011-2015 South Australian Waste Strategy* (the Strategy) is the key framework through which the State Government is pursuing its waste management objectives.

The Strategy will inform ZWSA's Business Plans over the next five years. It will be responsible for guiding State and Local Government activities and will involve business, industry and the greater community in its efforts (ZWSA 2011, p. 5). Box 2.1 below outlines the principles that guide the Strategy, which are set out in the *Zero Waste SA Act 2004*.

Box 2.1

**GUIDING PRINCIPLES FOR THE SA WASTE STRATEGY**

Zero Waste SA, is, in the exercise of its functions, to be guided by —

(a) the waste management hierarchy; and

(b) the principles of ecologically sustainable development as set out in section 10 of the *Environment Protection Act* 1993; and

(c) best practice methods and standards in waste management; and

(d) the principle that government waste management policies should be developed through a process of open dialogue with local government, industry and the community in which local government, industry and the community are encouraged to contribute to decision making.

Source: Zero Waste SA Act 2004, p. 3

The Strategy for the next five years will continue to focus on reducing the amount of waste going to landfill. Its short-term objectives include giving priority to other wastes such as liquid and agricultural wastes and continuing to encourage the importance of community engagement and sustainable practices. The Strategy's long-term objectives are to 'avoid and reduce waste' and 'maximise the useful life of materials through re-use and recycling'.

The waste strategy outlines targets that can be measured and tracked in stages. The key targets are outlined in Table 2.2.

Table 2.2

**WASTE STRATEGY TARGETS**

| Waste sector | Target |
|---|---|
| Household waste | 70 per cent diversion by 2015 |
| Commercial and industrial waste | 75 per cent diversion by 2014 |
| Construction and demolition waste | 90 per cent diversion by 2015 |

Source: Zero

In 2010, the *Environment Protection (Waste to Resources) Policy* (W2R EPP) was introduced to provide a stimulus for increased resource recovery and stronger compliance (Zero Waste SA 2010, p. 12). The W2R EPP supports the Strategy by:

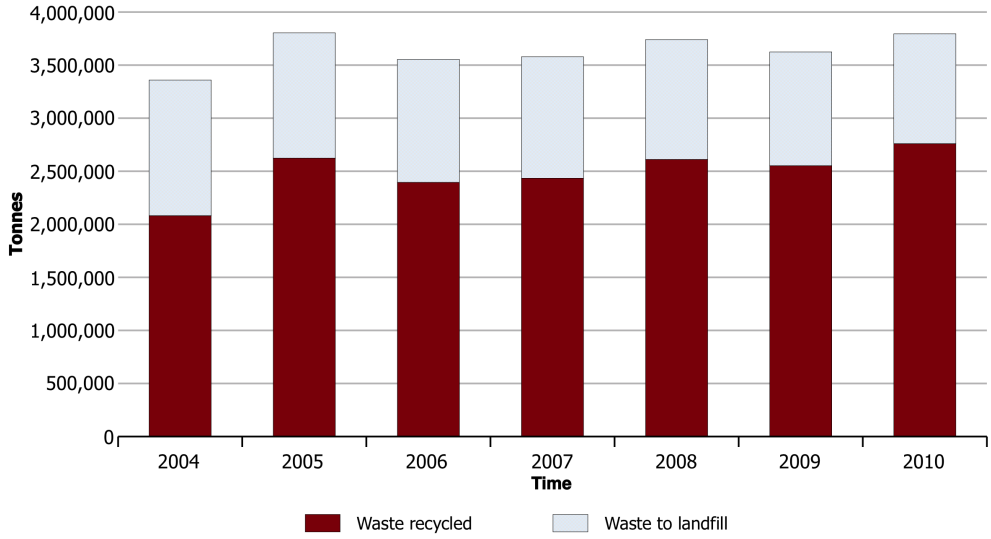
- prohibiting the disposal of certain forms of waste to landfill with fines of up to a maximum of $30,000; and

- requiring (by September 2012) that the majority of waste generated in metropolitan Adelaide is not diverted to landfill, unless it has first undergone an appropriate resource recovery process.

The result of SA's various initiatives for improving waste management practices over time is represented in Figure 2.2. This figure reports total waste generation in SA between 2004-2010 in terms of the amount of waste recycled and the amount sent to landfills over time[6]. Combined they represent total waste generation for SA in this time period.

Figure 2.2

**WASTE TO LANDFILL AND WASTE RECYCLED, 2004-2010**




Source: Data provided by ZWSA and Allen Consulting Group

In 2010 approximately 2.7 million tonnes of waste was directed to resource recovery. The amount of waste recycled as a total of waste generated from 2004-2010 demonstrates an upward trend from 2006 onwards. Since 2006, diversion rates have increased from 67 per cent to 73 per cent in 2010 (data provided by ZWSA).

SA is one of the top performing jurisdictions in the country in relation to recycling rates. In 2010, SA's per capita recycling rate of more than 1,500 kilograms per person per year was only exceeded by the Australian Capital Territory (1,800 kilograms). Its recycling efforts have prevented the equivalent of approximately 890 thousand tonnes of carbon dioxide from entering the atmosphere (ZWSA 2011a). Additionally, SA's reported diversion rate in 2010 was the highest of all jurisdictions. This can be seen in Table 2.3.

[6] Data on recycling only collected since 2004

Table 2.3

**QUANTITIES OF MATERIAL DISPOSED OR DIVERTED FROM LANDFILL**

| | New South Wales | Victoria | Queensland | South Australia | Western Australia | Tasmania/ Northern Territory/ A.C.T | Australia |
|---|---|---|---|---|---|---|---|
| Disposed at landfills ('000 t) | 6,255.4 | 2,623.3 | 5,040.9 | 785.0 | 2,279.2 | 746.3 | 17,730.1 |
| Recovered or reprocessed (all facilities) ('000 t) | 4,913.0 | 2,454.2 | 2,758.1 | 1,544.2 | 893.7 | 586.7 | 13,150.0 |
| Total ('000 t) | 11,168.4 | 5,077.5 | 7,799.0 | 2,329.2 | 3,172.9 | 1,333.0 | 30,880.0 |
| Diversion rate (%) | 44.0 | 48.3 | 35.4 | 66.3 | 28.2 | 44.0 | 42.6 |

Source: ABS, Catalogue No. 8698.0 Waste Management Services, Australia, 2009-10.

## 2.3 Benefits of resource recovery

Resource recovery involves the extraction of useful materials from waste for reuse. There are a number of environmental advantages of resource recovery such as saving valuable resources, avoiding the negative impacts related to extracting virgin materials for use in manufacturing and a decrease in the impacts resulting from landfill such as greenhouse gas emissions and contamination of surface and groundwater.

Generally speaking, it is the environmental contribution that is top-of-mind when considering resource recovery (as discussed in Chapter 6). However, the economic contribution can be quite significant as well.

The Australian waste and recycling industry in 2010 was valued between $7 billion and $11.5 billion per annum (DEWHA 2010, p. 228). Resource recovery and recycling have the potential to enhance productivity, generate employment and produce economic benefits throughout the Australian economy. Benefits can be derived directly from the growing recycling and waste services sector or indirectly through the activities of companies and organisations involved in waste and recycling.

Through resource recovery and recycling, new businesses are created for transporting, selling and processing recovered materials, and investment and employment can be increased (DEWHA 2010). Additionally, businesses that manufacture and distribute products created from recycled materials emerge and rely on the viability of strong resource recovery and recycling operations. By extension, communities can also benefit by selling their recyclable materials.

### *Investment and employment opportunities*

Recycling and resource recovery processes are typically labour-intensive activities. The type of skills required for resource recovery is varied, with Alternative Waste Treatment (AWT) facilities providing jobs for unskilled manual labour for sorting processes and other jobs that require complex engineering skills for processes such as renewable energy production (DEWHA 2010, p. 233 - 234) (see Box 2.2).

Recycling has a significant impact on employment opportunities, with 9.2 jobs generated per 10,000 tonnes of waste recycled relative to 2.8 jobs for landfill disposal (DEWHA 2010, p. 228). In national terms, the estimated direct labour force of jobs in recycling activities is approximately 22,000 FTE jobs and 7,000 FTE jobs in landfill operations, with a total of 29,000 FTE jobs throughout Australia (DEWHA 2010, p. 234).

The indirect labour force of recycling in Australia is estimated to be around 19,000 jobs — compared with 5,600 in landfill. When combined with direct labour force estimates, the number of jobs created in the resource recovery industry is estimated to be 48,000 (DEWHA 2010, p. 234). Core job types in the industry include:

- truck and forklift drivers;
- rubbish and recycling collectors;
- factory process workers;
- earth moving plant operators; and
- general and production managers (DEWHA 2010, p. 233-234).

Box 2.2

**ALTERNATIVE WASTE TECHNOLOGIES USED IN AUSTRALIA**

Alternative Waste Technologies (AWTs) are used to convert waste into energy or other useful by-products. AWT commonly refers to any technology that is applied to mixed waste other than traditional methods such as disposal to landfill (GHD 2009). AWTs cover a multitude of processes as outlined in.

A variety of AWTs are used in Australia, including:

- Mechanical biological treatment – mechanical separation of waste stream components followed by biological treatment of the organic fraction;
- Anaerobic digestion – biological treatment of organic waste in the absence of oxygen;
- Gasification – the partial oxidation of organic materials that are converted to a synthesis gas (or syngas), typically a mixture of carbon monoxide, hydrogen, carbon dioxide and methane;
- In-vessel composting – biological composting of organic waste in an enclosed container;
- Pyrolysis - the chemical decomposition of a material by heat in the absence of oxygen; and
- Tunnel composting – biological composting of organic waste in a purpose built enclosed or semi enclosed tunnels.

The major issues associated with the current and future use of AWTs is their financial viability. The low cost of landfill relative to the cost of AWTs is widely acknowledged as being a significant barrier to their use. Generally speaking, increasing landfill levies assists AWTs to become more financially viable as higher levies increase the costs of sending waste to landfill. However, landfill levies can have a mixed impact on AWT technologies as levies can have a negative impact if the residual wastes attract a levy payment on disposal (ASK waste management consultancy services 2010).

Source: The Allen Consulting Group

Improved management of waste and materials has been found in several countries, such as Australia and the United Kingdom to generate productivity and profit benefits within the economy. Enhanced efficiency on the use of materials may deliver significant productivity improvements for individual businesses. Additionally, improved productivity growth can stimulate national GDP and GDP per person (DEWHA 2010, p. 228).

### *Resource recovery and virgin resources*

Through the process of resource recovery the amount of virgin resources required for extraction and processing for the production of new products is reduced considerably. The environmental benefits for reduced manufacturing and decreased reliance on virgin resources include for example:

- increased water and energy savings;
- decreased greenhouse gas emissions; and
- conservation of non-renewable resources.

Additionally, a recent Australian study found that the avoided environmental cost of manufacturing generated through kerbside recycling can be up to 20 times greater relative to the environmental cost of collection and disposal of material (North East Waste Forum, 2011).

The economic benefits related to a reduced reliance on virgin resources include greater economic activity within a jurisdiction and growth in employment for the resource recovery industry. For example, increased economic activity within South Australia could be achieved through the transfer of activity away from domestic and overseas jurisdictions, which are engaged in extracting and processing virgin resources for the production of goods.

Economic activity would then be diverted to businesses within South Australia involved in resource recovery processes. Through greater economic activity, employment can be generated through a greater demand of skills required in the industry such as factory process workers and other jobs as mentioned above.

### *Other economic benefits*

Domestic and international experience and research demonstrate that enhanced materials efficiency and waste performance can generate a range of other economic benefits. For example, environmental and economic benefits can be achieved through the adoption of collaborative and cooperative approaches to the re-use of production process by-products on a regional scale.

As evidence of this, the National Industrial Symbiosis Program in the UK that involves over 8,000 participant companies has managed to redirect approximately 2.2 million tonnes of business waste from landfill. This has created up to 490 new jobs, decreased carbon emissions by over 2.1 million tonnes, produced £104 million in new sales and saved approximately £81 million for members of the program (DEWHA 2010, p. 235).

Similarly the Kwinana industrial area near Perth, WA supports various non-competing processing industries that collaborate in areas such as safety for the purposes of mutual interest and benefits. The industries including nickel, alumina, chemical factories, oil refineries, cement manufacturing, fertiliser plants and power plants.

The interdependent relationship developed by these industries and their close physical proximity has permitted for the trading of by-products for re-use and for cooperative energy efficiency measures. The participating Kwinana industries have established over 32 by-product re-use projects and over 15 mutually beneficial projects over the past 30 years (DEWHA 2010, p. 235).

Generally, businesses such as those in manufacturing and the supply chain can implement systems to produce benefits from likely waste streams, improve cost savings, decrease their environmental impact and receive benefits that have the potential to extend to the wider community. For example, companies that manufacture food products can choose to potentially manage their own wastes through onsite treatment procedures (DEWHA 2010, p. 234).

## 2.4 The Solid Waste Levy

The Solid Waste Levy is a charge paid by SA waste depot licence holders in SA on every tonne of solid waste disposed as landfill at waste depots across SA. The Levy promotes resource recovery as an alternative to waste to landfill.

Licence holders are required to pay the Levy under the *Environment Protection Act 1993*. The Environment Protection Authority (EPA) collects it on behalf of the SA Government. Currently, the Levy is collected by the EPA and distributed as follows:

- 50 per cent to Waste to Resources Fund[7];
- 5 per cent to the Environment Protection Fund managed by the EPA; and
- 45 per cent retained by the EPA thus reducing its call on Government appropriation.

Of the 50 per cent of the levy revenue transferred to the Waste to Resource Fund, ZWSA have an authorised annual expenditure of about $8.4 million which is just over half of funds transferred to the Waste to Resources Fund. Just under a quarter of the annual waste levy revenue therefore remains to accumulate in the Waste to Resources Fund. South Australian Government Budget forecasts (Dept of Treasury and Finance, Financial Statements 1 December 2011) estimate that there will be over $71 million of unspent monies in the Waste to Resource Fund by 2013-14.

The EPA's share of the Levy is used to manage the *Environment Protection Act 1993*, including activities such as licensing, compliance and waste tracking (EPA 2010).

[7] The Zero Waste Act 2004 requires 50 per cent of the levy revenue to be directed to the Waste to Resources Fund (established under Section 17 of the Act).

The Levy has increased progressively over the last decade as shown in Table 2.4. Some of these increases have occurred to keep the Levy in line with general price increases, while others have occurred to achieve specific revenue targets (See Zero Waste SA 2007).

Table 2.4

**SOLID WASTE LEVY RATES (PER TONNE), 2004-2011**

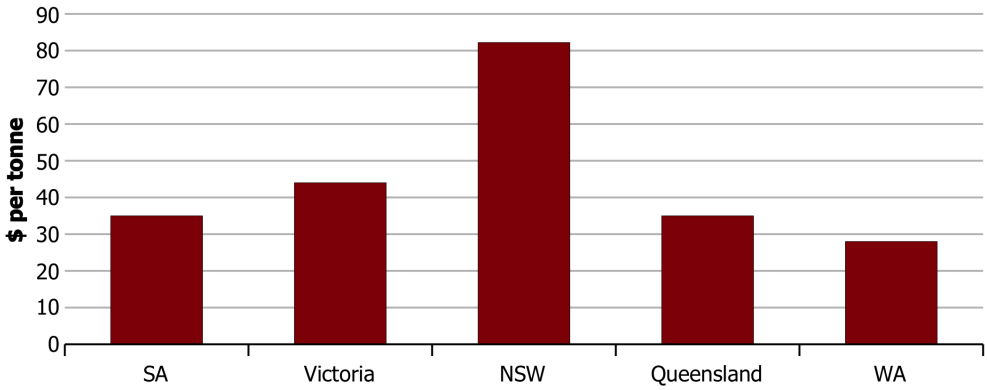
| Year | Metropolitan ($) | Regional ($) |
|---|---|---|
| 2004 | 8.2 | 4.1 |
| 2005 | 9.2 | 4.6 |
| 2006 | 10.2 | 5.1 |
| 2007 | 11.2 | 5.6 |
| 2008 | 24.1 | 12.1 |
| 2009 | 24.7 | 12.4 |
| 2010 | 25.4 | 12.7 |
| 2011 | 26.0 | 13.0 |
| 2012 | 35.0 | 17.5 |

Source: ZWSA and the Allen Consulting Group.

Levies similar to SA's are used around the country to address issues associated with landfill (see Figure 2.3). In essence, levies are a mechanism to correct 'market failures' relating to waste and its disposal (see Box 2.3) and to promote activities relating to resource recovery.

Figure 2.3

**METROPOLITAN INTERSTATE LEVY RATES 2011-2012 ($ PER TONNE)**




Note: SA non-metropolitan Levy rate $17.50; NSW regional regulated area $31.10; Victoria rural municipal $22 and Industrial $38.5. The Queensland levy commenced on 1 December 2011 but only applies to C&D and C&I. The Victorian Levy is forecast to increase to $53.20 in 2013-14. There are currently no Levies in ACT, Tasmania and the Northern Territory.
Source: ZWSA 2011, NSW Office of Environment & Heritage 2011, EPA Victoria 2011, QLD Department of Environment and Resource Management 2011, WME 2009

Box 2.3

**WASTE MARKET FAILURE IN THE WASTE INDUSTRY**

Market failures occur when impacts of an activity are not fully accounted for in an activity's price. If an activity's full costs are not accounted for, they can potentially generate negative social, economic and environmental consequences.

Activities associated with production, consumption and waste disposal present various market failures, including information failures and lack of competition in markets. Additionally, the existence of public goods and externalities include market failures such as:

- land alienation, pollution and loss of biodiversity associated with resource extraction;
- inefficient levels of resource conservation and exploitation;
- emissions of harmful substances associated with resource processing, transport, manufacturing or consumption; and
- impacts on local amenity and pollution associated with waste material collection, processing and disposal.

The rationale for policy interventions to address these market failures is that the interventions must generate more benefits than any costs introduced, and they must be demonstrated as the most effective of potential policy interventions. This rationale is the basis for why changes in waste management practices that lead to changes in resource utilisation at all stages of production-consumptions stages have not been introduced, as the presence of externalities is not sufficient to implement new policy interventions.

Source: MMA and BDA Group, *South Australia Waste Strategy 2005-2010: Ex-ante Benefit Cost Assessment*, p. 15.

*Chapter 3*

# Assessing the impacts of proposed changes to the Solid Waste Levy

Changes to waste policy and specifically, the Levy, have widespread implications on economic activity in SA. The majority of economic activity results in the production of some form of waste, and consequently all sectors of the economy will be affected by policy changes.

The purpose of a levy on landfill is to increase the cost of this activity, and promote alternative uses for waste. By inflating the cost of waste disposal, other mechanisms to dispose of waste to become more competitive and financially viable. Where feasible, would be anticipated that increases in the Levy typically result in a greater amount of waste recovered.

As part of this study, an impact assessment has been conducted on a range of potential Scenarios. This chapter outlines how the impact assessment has been undertaken. In examining changes to the Levy it is important that each change is assessed in a comprehensive and consistent manner. This chapter outlines:

- the assessment framework used in the impact assessment;
- the timeframe for analysis;
- proposed changes to the Solid Waste Levy;
- the Government policies included in the baseline case; and
- the baseline case and change scenarios.

## 3.1 Assessment framework

Levy changes impact on each sector of the waste industry in different ways. Some sectors may be impacted in a positive way, while for others the impact may be costly. Moreover, some sectors will be impacted only in a minor way, while there will be major impacts for others. The timing of these impacts will also differ.

Consistent with the Terms of Reference, this analysis focuses on those sectors that are most likely to be affected by changes to the Levy. This includes:

- landfill operators;
- the recycling industry – across all material streams;
- the waste to energy sector;
- alternative to landfill waste technologies (AWTs);
- local government (metropolitan and non-metropolitan);
- the South Australian Government;
- commercial and industry;

- households; and
- non-government organisations.

Recognising the wide range of impacts that changes to the Levy may have, the assessment considers the:

- market impacts;
- environmental impacts; and
- social impacts.

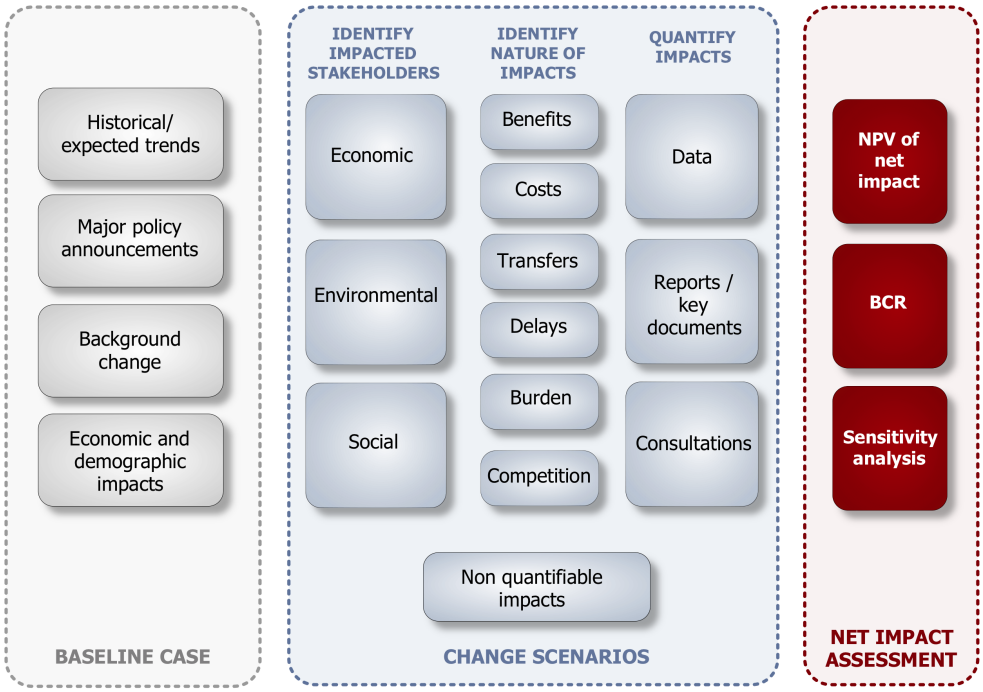
Specifically, the review modelled the impact of various changes to the Solid Waste Levy on:

- resource recovery;
- landfill;
- greenhouse gas emissions;
- the South Australian Government;
- Local Government;
- the commercial and industry sectors; and
- households.

In order to ensure reliability in measuring these impacts a consistent and comprehensive framework has been used for the analysis of each Scenario. This framework is illustrated in Figure 3.1.

Figure 3.1

**THE ACG EVALUATION FRAMEWORK**




Source: The Allen Consulting Group

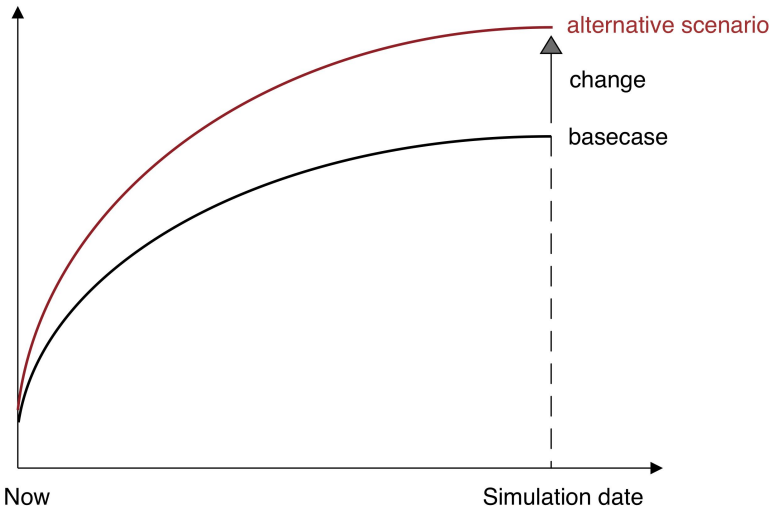
The broad approach of this analysis is to apply a with/without comparative static. In essence, this evaluation asks: *what is the difference in costs and benefits if the baseline case is implemented compared to the implementation of a different Scenario?* This is a common technique used for evaluations of this nature and is consistent with other policy analyses of this nature. The Commonwealth Treasury for example, makes this point explicitly (Treasury 2011, pg. 24).

> Scenario modeling does not predict what *will* happen in the future. Rather it is an assessment of what *could* happen, given the structure of the models and input assumptions.
>
> Scenarios are an analytical lens through which to view a problem; they do not factor in all elements of the 'real world'… Scenarios guide understanding of policy impacts, relativities of different policy options and the extent that parts of the economy (technology, preferences and so on) need to shift from current trends to achieve particular outcomes, given the model's assumptions.

This approach allows the analysis to specifically isolate the impacts of proposed Levy changes and abstract away from other economic developments holding all else constant. The added benefit of this approach is that estimates of baseline waste production and diversion rates — which can be inherently difficult to estimate — are not as important to the analysis as the changes scenarios can impose. The with/without principle is depicted in the figure below.

Figure 3.2

**COMPARATIVE STATIC INTERPRETATION OF RESULTS**




Source: Allen Consulting Group analysis, 2010.

Where appropriate, the economic, social and environmental impacts have been quantified to inform the net impact assessment. However, it is not always possible to quantify these impacts — particularly in monetary terms. Where impacts have proven difficult to quantify, impacts are noted and their likely impact on the overall bottom line assessed qualitatively. Table 3.1 outlines potential economic, environmental and social impacts associated with changes to the Levy. Some impacts, such as resource recovery volumes and costs or GHG emissions, have both economic and environmental dimensions and could be classified as either.

In addition, a range of indirect impacts have been assessed quantitatively. These include the impact on the waste to energy and the alternative to landfill waste technology sectors, various environmental impacts and additional market impacts such as the transfer of economic activity from jurisdictions that are engaged in virgin resource recovery to SA.

Table 3.1

**ECONOMIC, ENVIRONMENTAL AND SOCIAL COSTS AND BENEFITS**

| Impacts | Examples |
|---|---|
| Economic | Landfill volumes and costs |
| | Resource recovery volumes and costs |
| | Implications for the waste to energy and alternative to landfill waste technology sectors |
| | Revenue implications |
| Environmental | Emissions savings reduced GHG emissions |
| | Dis-amenity |
| | Leachate |
| | Airborne emissions |
| Social | Consideration of the distribution of benefits and costs |
| | Costs to households and businesses |
| | Impact on the SA Government and the Local Government sector |

Source: The Allen Consulting Group

## 3.2 Timeframe for analysis

This analysis is focused on the impact of Levy changes proposed for 2013-14 and their impacts to 2014-2015. The impacts of changes to the structure and quantum of this Levy have been analysed over this time period. This timeframe is consistent with the *South Australian Waste Strategy (2011-2015)*[8].

## 3.3 The baseline case

In order to isolate the impacts arising from changes to the Levy, it is necessary to compare the differing changes with a reference Scenario representing the structure and quantum of the Levy that would have occurred without any policy change — the baseline case. This study examines the baseline case and compares it to three scenarios, each with its own unique characteristics.

This baseline case has been developed to provide a benchmark comparator to assess the impacts of the different Scenarios. It reflects the current trends, direction and state of the waste industry, as well as wider economic trends. The costs and benefits of the options are estimated as the difference between the costs (or benefits) already being incurred in the base case, and the *additional* cost (or benefit) that can be attributed to the option being considered. The base case and subsequent Scenario analysis are characterised by a variety of assumptions. The assumptions made in the areas of waste generation, landfill and recycling and revenues are discussed below.

[8] Notably, some medium to longer term impacts, such as increased diversion, technological adjustment and employment may not be fully realized in this timeframe.

Conceptually, the baseline case is a description of what is likely to happen to the level of waste generation, recycling and volumes to landfill if the current situation including the Levy amount, household, business and industry attitude to waste and recycling and government policies are maintained. For this analysis it is assumed that all current government policies will remain in place over the stated timeframe. It should be noted that while the analysis takes into account current Government policy, the stated impacts might be affected by future government policy.

The 2010-11 South Australian budget includes an increase to the Levy in 2011-2012:

- from $26 a tonne to $35.11 a tonne in Metropolitan Adelaide; and
- from $13 a tonne to $17.55 a tonne in Non-metropolitan Adelaide.

It is anticipated that the Levy will progressively increase beyond this to at least $50 a tonne in metropolitan Adelaide to align it with Levies in other Australian states.

A detailed discussion of the baseline estimates, including landfill, diversion and revenues is provided in Appendix C.

## 3.4 Government policies included in the baseline case

Included in the baseline are existing waste management strategies at the State (such as the *South Australian Waste Strategy*) and national level (such as the *National Waste Policy*), as well as other major announced government policies.

Of particular note are the Carbon Price Mechanism (CPM) and the Environment Protection (Waste to Resources) Policy. These policies are likely to have a considerable impact on the waste sector.

### *The waste sector and the Carbon Price Mechanism*

The *Clean Energy Future Act 2011* set a carbon price for Australian businesses of $23 per tonne from 1 July 2012, rising 2.5 per cent in real terms per year until 2014-15. From 2015-16 onwards the market will effectively set the carbon price, with a price floor set at $15 per tonne and a price ceiling of $20 above the international price (Commonwealth of Australia, 2011c).

The Government is aiming to reduce carbon pollution levels by 5 per cent on year 2000 levels by 2020, and by 80 per cent compared to year 2000 levels, by 2050 (Commonwealth of Australia, 2011c). As progress is made toward these targets, the number of carbon permits available will be reduced, causing scarcity in the market that may increase the demand for existing permits, increasing prices and thereby making highly polluting business practices less profitable.

Around 500 of the largest polluters in Australia will need to purchase carbon permits to offset their emissions. Of these 500 companies, 190 (28 per cent) are expected to come from the waste industry (see Table 3.2).

Table 3.2

**BUSINESSES REQUIRED TO PURCHASE CARBON PERMITS**

| Industry | Number of companies effected |
|---|---|
| Waste | 190 |
| Coal and mining | 100 |
| Electricity generation | 60 |
| Industrial processes (incl. chemicals and cement industries) | 60 |
| Other fossil fuel intensive sectors | 50 |
| Natural gas retailers | 40 |

Source: Commonwealth of Australia, 2011a

It is estimated that landfill produces around 3 per cent of Australia's greenhouse gas emissions, the equivalent of 15 million tonnes of carbon dioxide (Commonwealth of Australia, 2011b). The majority of the emissions from landfill are in the form of methane emissions produced from the anaerobic decomposition of organic waste by microorganisms. One molecule of methane gas' global warming potential is 21 times greater than that of one molecule of carbon dioxide, over a 100 year time horizon (United Nations Framework Convention on Climate Change, 2011).

Under the carbon price mechanism, landfill sites with historical emissions equivalent to 25,000 tonnes of carbon dioxide or greater in one year will be required to pay for the greenhouse gas emissions from their landfill (see Box 3.1).

In essence, the carbon price mechanism will increase the cost of sending waste to landfill. Estimates of the amount of carbon per tonne of waste and their cost implications are outlined in Table 3.3. With the introduction of a carbon price, it is anticipated that gate fees would increase to take account of the additional cost associated with its implementation. However, some landfills will undertake certain processes to reduce their net emissions, such as composting and flaring (combustion of methane from landfill), thereby reducing the additional costs associated with a carbon price. The CPM is estimated to impose an average cost per tonne of landfill of $11.97 (estimated at a carbon price of $23/t$CO_2$-e).

Box 3.1

**LANDFILL AND THE CARBON PRICE MECHANISM**

Landfill operators will not be required to pay for methane produced from the breakdown of material deposited in the landfill prior to 1 July 2012, however these emissions will be included when determining if the landfill facility exceeds the 25,000 tonnes threshold (Commonwealth of Australia, 2011c). Without action taken to reduce emissions output, one tonne of domestic waste would be expected to result in 1.2 tonnes of carbon emissions (Commonwealth of Australia, 2011b). The Government has indicated that landfills that service populations of 20,000 should examine whether their landfill exceeds the 25,000 tonne threshold (Commonwealth of Australia, 2011b).

The National Greenhouse and Energy Reporting (Measurement) Determination 2008 outlines various methods by which the levels of methane released from a landfill site are to be estimated (see Australian Government, 2009). The first of these methods involves determining the amount of municipal, commercial and construction waste received at the landfill. Each waste type has an organic component (that is, food, wood, green garden waste, textiles, paper etc.) which determines the amount of greenhouse gas emissions that would be released when the waste degrades in landfill. Those landfill sites liable under the carbon price mechanism will need to pay for the methane released based on the average composition waste types (that is municipal, commercial and industrial).

Alternatively, emissions from a landfill can be estimated via monitoring the methane release from representative sample of a landfill. The rate of methane release from the representative sample is extrapolated to determine the rate of methane release for the whole landfill site. This estimate of methane release determines the amount of carbon credits required for the landfill's operations.

Methane continues to be released from landfill sites for many years after the waste is initially deposited at the landfill. This creates a number of challenges for those managing the operations of landfill sites. Firstly, the client for a landfill pays for the waste disposal when depositing the rubbish. This is paid through either local council rates for kerbside waste collection services, or through payments at the waste-handling centre. The challenge for those managing landfill sites is to ensure that the price charged for waste disposal incorporates these longer-term costs resulting from a fluctuating carbon price.

However, the introduction of the carbon price also offers a number of opportunities for landfill operators to reduce the amount of methane released into the atmosphere in ways that were previously uneconomical. To reduce their liability under the carbon pricing mechanism landfill operators can collect the gas produced and convert it into the less active carbon dioxide through burning it or, in some cases, the methane can be harvested and used for fuel. Additionally, the introduction of a carbon price provides further incentive for landfill operators to expand alternative waste technologies such as waste diversion, recycling and composting that have a reduced impact on greenhouse gas levels in the environment (Commonwealth of Australia, 2011b).

Source: Commonwealth of Australia, 2011b; Commonwealth of Australia, 2011c

Table 3.3

**ADDITIONAL COSTS ASSOCIATED WITH A CARBON PRICE, 2011**

| | MSW | C&I | C&D |
|---|---|---|---|
| Gross emissions per tonne of landfill, $CO_2$-e/t | 1.19 | 1.08 | 0.17 |
| Emissions liable under CPM, per cent | 60 | 60 | 60 |
| Net emissions per tonne of landfill, $CO_2$-e/t | 0.71 | 0.65 | 0.10 |
| Carbon Price, $/t | 23 | 23 | 23 |
| Landfill, per cent | 30 | 43 | 27 |
| ***Average CPM cost for SA Waste sector $/t landfill*** | | | ***11.97*** |

*The average cost had been adjusted based on the net amount of liable landfill emissions, recognising the effects of capping. It also includes the effect of landfill methane loss and the methane released before waste emissions are capped.
Source: Stakeholder consultations and data, Allen Consulting Group analysis.

Under the CPM, the social costs of GHG emission associated with sending waste to landfill are internalised (that is, they are included in the costs paid in relation to sending waste to landfill). The key to the operation of the CPM is that the firms and consumers that create the externalities take them into account when making their decisions, as the price reflects these externalities. As such it is anticipated that the carbon price will lead to higher diversion rates of waste to landfill in its own right. This analysis focuses on the change in volumes of waste sent to landfill, which are a result of Levy changes. The effect of the CPM has been examined in the baseline case and therefore throughout all the assessed scenarios.

### *The Environment Protection (Waste to Resources) Policy*

In 2010, the EPA introduced a the *Environment Protection (Waste to Resources) Policy* (W2R EPP), which provides a stimulus for increased resource recovery and stronger compliance (Zero Waste SA 2010, p. 12).

The W2R EPP supports South Australia's Strategic Plan of reducing waste to landfill by 25 per cent by 2014 and came into effect on 1 September 2010. The W2R EPP grants the South Australian EPA broader powers to reduce the amount of waste going to landfill (AIG 2011).

From 2010-2013 various forms of waste will progressively be banned from going to landfill and will instead be diverted to a process of recovery, reuse and recycling of materials and energy. The various types of waste to be involved in this system include those with prospective resource value such as television screens, computer monitors, light globes and whitegoods (AIG 2011).

To support the State Government's Strategic Plan and its reuse targets, the W2R EPP will among other objectives:

- prohibit the disposal of certain forms of waste to landfill with fines of up to a maximum of $30,000; and
- require by September 2012 that the majority of waste generated in metropolitan Adelaide is not diverted to landfill, unless it has first undergone an appropriate resource recovery process (AIG 2011).

Key features of the W2R EPP already in place or to be introduced by 2013 are outlined in Box 3.2.

Box 3.2

**KEY FEATURES OF THE W2R EPP**

**From September 1 2010**

- Landfill banks — The first of staged provisions prohibiting the disposal of certain waste types to landfill comes into effect. Includes: hazardous waste; lead acid batteries; liquid waste; medical waste; oil; whole tyres; aggregated cardboard and paper; aggregated glass packaging; aggregated metals; aggregated PET or HDPE plastic packaging; and vegetative matter collected by councils.
- Illegal dumping — Improved illegal dumping and unauthorised stockpiling controls come into effect, with penalties of up to $250,000. An EPA license is still required for the receipt and disposal of waste.
- Waste transport — Risk management requirements will apply for any person who transports waste (licensed or unlicensed) with penalties of up to $30,000 for non-compliance. An EPA license, compliance with all license conditions and the completion of waste transport certificates are still needed for the transport of waste.
- Listed wastes — Disposal obligations will apply to unlicensed activities involving listed wastes, with penalties of up to $30,000 for non-compliance.
- Medical waste — New treatment or disposal methods for medical waste may be approved by the EPA.
- When waste constitutes a product — EPA standards may specify when a waste constitutes a product.
- Weekly waste collection — Weekly collection of residual domestic waste will be mandated for metropolitan councils.
- EPA considerations — This includes when determining matters in relation to development applications or license applications/renewals.
- Waste management codes of practice — Industry specific waste management codes of practice to specify what actions will satisfy the general environmental duty may be prescribed. Currently, the only one code of practice has been prescribed, the nationally developed 'Industry Code of Practice for the Management of Clinical and Related Wastes'.

**From September 1 2011**

- Landfill bans — The second of staged provisions prohibiting the disposal of certain waste types to landfill comes into effect. Includes: vehicles; PP or LDPE plastic packaging and white-goods.

**From September 1 2012**

- Landfill bans — The third of staged provisions prohibiting the disposal of certain waste types to landfill comes into effect. Includes: PVC or PS plastic packaging; fluorescent lighting; computer monitors and televisions; and whole earthmover tires.
- Medical sharps — Medical sharps will be banned from household kerbside bins.
- Treatment of waste prior to landfill — Waste from metropolitan Adelaide (subject to exemptions) will be required to be subject to resource recovery processes prior to disposal at landfill.

**From September 1 2013**

- The fourth and final of staged provisions prohibiting the disposal of certain waste types to landfill comes into effect. Includes fluorescent lighting; computer monitors and televisions; and other electrical or electronic equipment.

Source: EPA South Australia 2010

## 3.5 Proposed changes to the Solid Waste Levy

The value and coverage of the Levy will influence the amount of waste sent to landfill. To illustrate these impacts, this study has assessed four Scenarios (in addition to the baseline case). Each Scenario contains differences in the Levy or other influential changes as outlined in Table 3.4. A more detailed outline of the three Scenarios is provided in Appendix D. Further details about the assumptions underpinning the analysis are summarised in Appendix F.

Table 3.4

**SCENARIOS ASSESSED**

| Scenario | Description |
|---|---|
| Baseline case | Maintain the current Levy and increase with CPI. |
| Scenario 1 | Scenario 1 assesses the impacts of a step increase in the Levy across all sectors in 2013-14. |
| Scenario 2 | This Scenario involves assessing the impacts of applying a differential levy by waste sector. The Levy paid by MSW is not increased. |
| Scenario 3 | A differential Levy applied on the basis of location. Scenario 3 exempts regional areas from the Levy increase. |
| Scenario 4* | This Scenario involves Levy changes identical to that of Scenario 1, but includes a change in how the Levy is administered. Under this scenario, transfer stations would be required to collect a levy on all waste received. A rebate for recycling and recovery (actual sales) would then be provided. |

* Note: The impacts of this Scenario are not expected to be materially different to from Scenario 1, as the two Scenarios have the same associated Levy amounts. Hence, the modelling results of this Scenario are not reported in the subsequent chapters, but discussed quantitatively where they differ from the results of Scenario 1.
Source: The Allen Consulting Group.

Table 3.5 outlines the Levy amounts in the baseline case and each scenario in 2013-14, as this is when all the significant increases in the Levy take effect. After 2013-14 increases are in line with SA's Department of Treasury and Finance's Indexation factor.

Table 3.5

**SCENARIOS — CPI ADJUSTED LEVY RATES, 2013-14**

| Scenario | Value of Levy in 2013-14, $ | | | | | |
|---|---|---|---|---|---|---|
| | Metropolitan Adelaide | | | Non-metropolitan Adelaide | | |
| | MSW | C&I | C&D | MSW | C&I | C&D |
| Baseline case | 37.3 | 37.3 | 37.3 | 18.7 | 18.7 | 18.7 |
| Scenario 1 | 50.0 | 50.0 | 50.0 | 25.0 | 25.0 | 25.0 |
| Scenario 2 | 37.3 | 50.0 | 50.0 | 18.7 | 25.0 | 25.0 |
| Scenario 3 | 50.0 | 50.0 | 50.0 | 18.7 | 18.7 | 18.7 |

Source: The Allen Consulting Group

### *Gate fees*

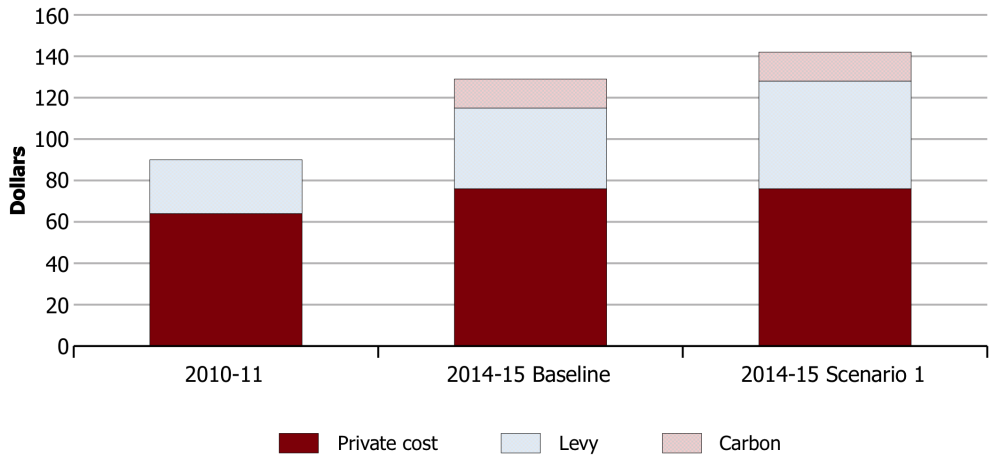
Based on discussion with industry in relation to current gate fees, a current landfill gate fee of around $90 has been used in this analysis. This fee was said to include GST, private costs and the current levy. Using this information the impact of the CPM, as well as Levy increases, was used to calculate the gate fees payable.

The main driver of the increase in gate fees between 2010-11 and 2014-15 is the increase in Levy rates. Additionally the implementation of the carbon tax also contributes to the higher gate fees.

The composition of gate fees in metropolitan areas is illustrated in Figure 3.3. It has been estimated that in 2010-11, 29 per cent of the gate fee is due to the Levy and 71 per cent due to private costs and profit. In 2014-15 under the baseline case, 30 per cent of the gate fee is due to the Levy, 11 per cent due to the carbon price and 59 per cent attributable to private costs and profit. Under Scenario 1 in 2014-15, private costs and profit account for 54 per cent of the gate fee, with the Levy accounting for 36 per cent. The carbon price accounts for 10 per cent of the gate fee.

Figure 3.3

**EXAMPLE COMPOSITION OF GATE FEES, METROLPOITAN AREA**




Note: The figures above are estimated for an average metropolitan landfill facility.
Source: Stakeholder consultations and data, Allen Consulting Group analysis.

*Chapter 4*

# Market impacts

This chapter describes the market impacts of changes in the Solid Waste Levy for each of the identified Scenarios. It does this by considering the likely impacts the Levy would induce across the community. These impacts principally relate to either:

- the economy wide impacts that accrue by diverting waste away from landfill; and
- the costs incurred by diverting waste towards resource recovery.

Except where indicated, the impacts of Scenario 4 are not expected to be materially different from Scenario 1. The impacts of Scenario 4 therefore have not been individually assessed.

Detailed impacts of the various Scenarios on waste to landfill, resource recovery, diversion rates and revenue in aggregate, on each waste sector, by geographical area and by year are outlined in Appendix G.

## 4.1 Impacts on the resource recovery sector

By its nature, resource recovery is a higher cost process for managing and treating waste than is landfill. This is such, as the marginal cost, or the cost of sending an additional tonne of waste to resource recovery is higher than the marginal cost of sending it to landfill. However, while increases in resource recovery increase the economic cost of waste disposal there are a number of other economic, environmental and social benefits as well.

The Levy increases the relative competitiveness of existing and emerging resource recovery technologies. In turn, this raises the demand for resource recovery, as the community substitutes from landfill to recycling and additional uses of waste are discovered.

Stakeholders identified several key factors that may mitigate substitution between landfill and resource recovery. The first of these factors is the price obtained for recovered resources and recycled materials. It was noted that the recycling industry operates within a global market and therefore outputs need to be competitively priced. If prices obtained for certain recovered resources are too low then these will not be recycled. As an extreme example, it is known that during the Global Financial Crisis (GFC), at least one recycler completely shut down for this reason. However, this could also be the case for certain types of waste, whereby recyclers do not accept them due to their acceptance being unprofitable. This has clear ramifications for the amount of waste recycled and hence sent to landfill, as prices received for recovered materials will dictate the demand for such waste.

It was suggested by stakeholders that to mitigate the risks of market forces leading to lower levels of resource recovery, ZWSA should use some of the funds from the Levy to assist with market development. It was suggested that sustainable resilient markets would reduce the risk of lower prices and therefore lower levels of resource recovery. However, it is noted that ZWSA have been running a "Sustainable Markets" Grant since the onset of the GFC.

The other major impact is the effect of contamination levels of materials sent to resource recovery centres. Contamination levels significantly influence the recovery process. Stakeholders noted that source separation is critical and to enhance this, and reduce contamination, complementary measures other than the Levy are needed. During the consultation process, it was noted that resource recovery centres are receiving increasingly marginal loads with lower yields, which results in greater waste residuals. Since recyclers have to pay the levy on residual waste, the higher the contamination rates of materials, the greater the costs of resource recovery.

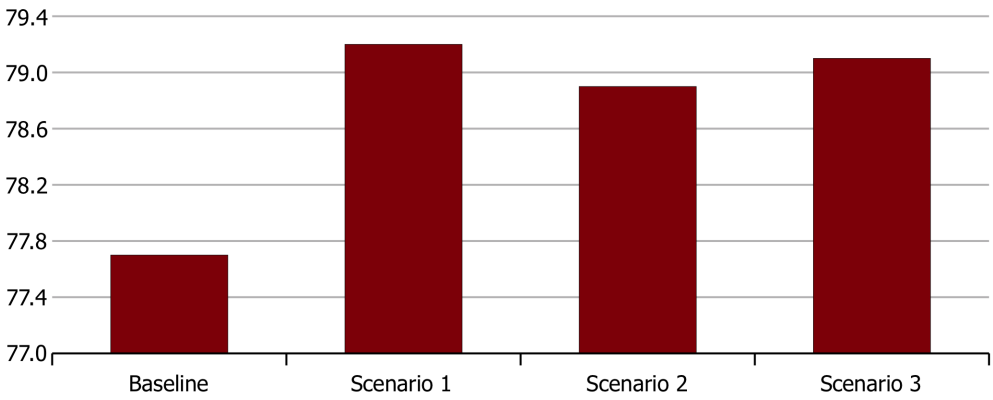
Another key issue in relation to resource recovery that was raised was the use of recovered resources. It was suggested that some recovered resources are not used to their highest value use and that this went against the sustainability and environmental objectives of the Levy. For example, lower level uses such as energy recovery may be preferentially priced within the market place than a higher level use which can recover the resources for reuse (TJH Management Services Pty Ltd, 2007 p. 13).

Various stakeholders also raised the timing of announcements to changes in the Levy as an issue. It was proposed that to alter behaviour and practices, and influence investment decisions, long timeframes were required for businesses to adjust.

The impacts on resource recovery have been estimated for each of the scenarios[9]. The key driver behind the market impacts is the expected diversion rate. The diversion rate in 2014-15 for each scenario is presented in the figure below.

Figure 4.1

**EXPECTED AVERAGE DIVERSION RATES OF WASTE TO LANDFILL, 2014-15**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

[9] For further information on how the baseline case was estimated see Appendix C.

Overall, resource recovery increases under each of the Scenarios assessed (relative to the baseline case). This can be seen in Table 4.1. The increases in the tonnes of resources recovered are in direct proportion to the differences in waste to landfill. This occurs, since waste that is not sent to landfill is recovered.

Table 4.1

**RESOURCE RECOVERY, DEVIATION FROM BASELINE ('000 TONNES)**

| | 2013-14 | | | 2014-15 | | |
|---|---|---|---|---|---|---|
| Scenario | Deviation from baseline '000 tonnes | Deviation from baseline per cent | Diversion rate per cent | Deviation from baseline '000 tonnes | Deviation from baseline per cent | Diversion rate per cent |
| Scenario 1 | 56.8 | 1.9 | 78.9 | 59.6 | 1.9 | 79.2 |
| Scenario 2 | 47.8 | 1.6 | 78.7 | 50.2 | 1.6 | 78.9 |
| Scenario 3 | 52.6 | 1.7 | 78.8 | 55.4 | 1.8 | 79.1 |

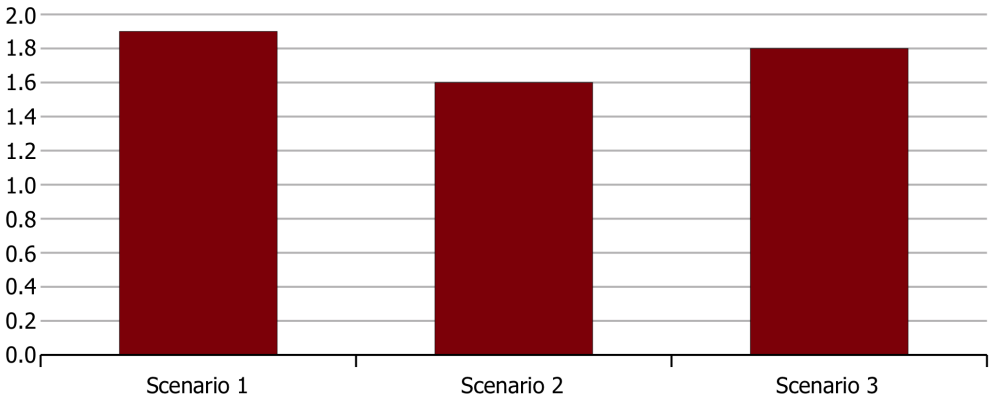
Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

Scenario 1 has the greatest impact on the volume of resource recovery, increasing it by nearly 1.9 per cent in 2014-15. This is a reflection of the higher costs for disposing waste to landfill under this Scenario, which has the highest Levy rates across all sectors and regions. This represents an additional 59.6 thousand tonnes of waste sent to resource recovery relative to the baseline case, with a total of 3.136 million tonnes sent to resource recovery.

Under the other Scenarios resource recovery is increased, but to a lesser extent (as seen in Figure 4.2). Scenario 2 has the lowest impact on the amount of waste sent to resource recovery, increasing it by 1.6 per cent. This is a result of a significant proportion of landfill (MSW- which makes up 30 per cent of landfill) not being subject to any increases in the Levy, relative to the baseline case.

Figure 4.2

**RESOURCE RECOVERY, PERCENTAGE CHANGE FROM THE BASELINE, 2014-15**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

The changes in the Levy associated with each Scenario have differing impacts on resource recovery by sector, as seen in Table 4.2.

Table 4.2

**RESOURCE RECOVERY AND DIVERSION BY SECTOR, 2014-15**

| | Scenario 1 | | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|---|---|
| Sector | Resource recovery per cent deviation from baseline | Diversion rate per cent | Resource recovery per cent deviation from baseline | Diversion rate per cent | Resource recovery per cent deviation from baseline | Diversion rate per cent |
| MSW | 2.3 | 59.5 | 0.0 | 58.2 | 2.0 | 59.3 |
| C&I | 2.3 | 63.5 | 2.3 | 63.5 | 2.0 | 63.3 |
| C&D | 1.7 | 93.8 | 1.7 | 93.8 | 1.7 | 93.8 |
| Total | 1.9 | 79.2 | 1.6 | 78.9 | 1.8 | 79.1 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

Although the Levy increases can be expected to generate some considerable benefits, it is unlikely that all waste diversion targets set in *South Australia's Waste Strategy 2011-15*, will be achieved. The waste strategy outlines targets of 70 per cent diversion for household waste by 2015, 75 per cent diversion for commercial an industrial waste by 2014 and 90 per cent diversion for construction and demolition waste by 2015. As seen in Table 4.2, it is anticipated that only the target for construction and demolition waste will be achieved, with the diversion rates for the other sectors considerably below the identified targets.

The main impacts on each of these in 2014-15 are:

- **Metropolitan Adelaide** – Increases are relatively consistent under all Scenarios for metropolitan Adelaide, increasing resource recovery by close between 1.9 and 2.3 per cent.
- **Non-metropolitan Adelaide** – Increases vary under Scenario 1 and 2 for non-metropolitan Adelaide, increasing resource recovery by 0.7 and 0.4 per cent respectively. Under Scenario 3 resource recovery does not change relative to the baseline since the Levy paid for non-metropolitan Adelaide in Scenario 3 is the same as the baseline case and therefore has the same effect.
- **MSW, C&I and C&D** – The MSW, C&I and C&D sectors of waste are affected in a similar way under each Scenario, increasing resource recovery by between 2.0 and 2.3 per cent, with the exception of MSW under Scenario 2. Resource recovery does not change relative to the baseline since the Levy paid for MSW in Scenario 2 is the same as the baseline case and therefore has the same effect.

## 4.2 The landfill sector

The impacts on landfill are largely the opposite of resource recovery, as waste that is to be treated in a resource recovery process is no longer sent to landfill. Increases in the gate fees can reduce the volume of waste resources sent to landfill. This occurs since the gate price of landfill is a function of the Levy as well as other operating costs (TJH Management Services Pty Ltd, 2007 p. 13).

Several issues were raised in relation to Levy changes for the landfill sector. It was noted that the value of the Levy charged to landfill sites is independent of the environmental standards the individual site is meeting. Further, stakeholders commented that some landfills have undergone significant investment to lift their environmental standards in recent years, which has significantly reduced their effect on the environment, particularly with the introduction of landfill lining and gas capture. However, it is noted that the levy is not explicitly intended to improve the environmental performance of landfills (as regulations mandate these), but rather to provide a financial signal that encourages resource recovery.

In relation to capacity, landfill operators indicated that there was still ample spare capacity at their sites and that this was not an issue within the sector.

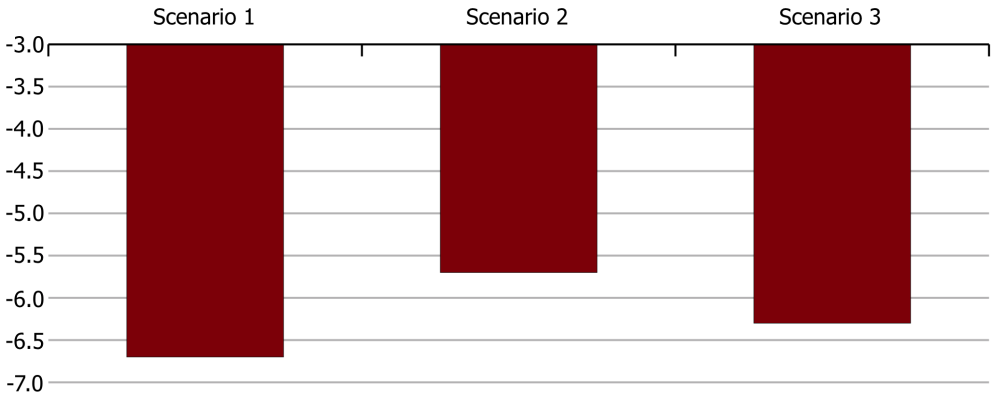
In all Scenarios examined, the changes to the Levy reduce the volume of waste going to landfill by 2014-2015 relative to the baseline case (in direct proportion to the increases in resource recovery outlined in Table 4.1).[10] The reduction in waste sent to landfill as a percentage change from the baseline is demonstrated in Figure 4.3[11]. Scenario 1 has the greatest impact on the volume of waste sent to landfill, which reflects the fact that the Levy increases are highest under this Scenario across the sectors and areas. Under this Scenario, landfill is reduced by 6.7 per cent in 2014-15 relative to the base case.

[10] The modelling undertaken has assumed that waste generation over the timeframe analysed does not change. This is such, as the impact on the majority of waste generators, such as households and small businesses, and the associated increase in cost over the timeframe analysed is not estimated to be large enough, on an individual basis,

Scenario 2 has the lowest impact on the amount of waste sent to landfill, reducing waste sent to landfill by 5.7 per cent. This is a result of a significant proportion of landfill (MSW- which makes up 30 per cent of landfill) not being subject to any increases in the Levy, relative to the baseline case.

Figure 4.3

**LANDFILL, PERCENTAGE CHANGE FROM THE BASELINE, 2014-15**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

The changes in the Levy associated with each Scenario have differing impacts on waste to landfill by geographical area and waste sector. The main impacts on each of these in 2014-15 are:

- **Metropolitan** — All three Scenarios have a similar impact on the amount of waste sent to landfill relative to the baseline case, reducing waste to landfill by between 6.5 and 7.5 per cent in each Scenario. However, it should be noted that Scenario 2 has a slightly lower impact than the other Scenarios.
- **Non-metropolitan** — Scenario 1 and 2 have the greatest effect on landfill volumes, reducing landfill by 3 and 2 per cent respectively, compared to the baseline case. However Scenario 3 has no effect on non-metropolitan landfill relative to the baseline case. This occurs since the Levy paid for non-metropolitan Adelaide in Scenario 3 is the same as the baseline case and therefore has the same effect.
- **MSW** — Scenarios 1 and 3 have a fairly similar impact on waste to landfill for MSW, reducing it by approximately 3 per cent relative to the baseline case. However Scenario 2 has no effect on landfill relative to the baseline case. This occurs since the Levy paid for MSW in Scenario 2 is the same as the baseline case and therefore has the same impact.
- **C&I** — Scenarios 1, 2 and 3 all have a similar impact on C&I reducing waste by between 3 and 4 per cent.

to change behaviour. However, it should be noted that over the longer-term businesses and households could change their behaviour, such as by sourcing products with lower packaging, and therefore generate less waste.

[11] Percentages differ from Figure 4.2 because the denominator is different-this figure measures the change in relation to landfill.

- **C&D** — Scenarios 1, 2 and 3 all have a significant impact on C&D waste sent to landfill, reducing waste by 20 per cent.

## 4.3 The waste to energy and the alternative to landfill waste technology sectors

An important factor, which heavily influences the financial viability of AWTs, is the prices that can be obtained for outputs. If outputs are valued and can be sold into various markets then this will significantly impact on the viability of AWTs processing waste. This has implications similar to those noted for recovered resources.

In order to examine the influence of Levy changes, it is therefore important to examine the costs of differing AWTs to establish under what Levy increases they will begin to become viable, these are outlined in Table 4.3.

Table 4.3

**INDICATIVE COSTS OF AWTS**

| Waste Management Technology | Low Unit Cost $ per tonne, 2011 $ | High Unit Cost $ per tonne, 2011 $ |
|---|---|---|
| **Indicative Waste Management Costs (based on literature and consultation with industry representatives)** | | |
| Landfill, bioreactor | 71 | 95 |
| Materials recycling | 107 | 131 |
| Open window composting | 36 | 47 |
| Vermicomposting | 47 | 71 |
| Enclosed aerobic composting | 83 | 131 |
| Enclosed anaerobic digestion | 95 | 178 |
| Mass burn incineration | 202 | 297 |
| Advanced thermal processes | 119 | 202 |
| Mechanical and Biological Pre-treatment | 190 | 237 |
| **Indicative Waste Management Costs for Emerging Technologies (claimed by technology providers)** | | |
| Brightstar (SWERF) | 59 | 71 |
| Novera (Re-OCC system) | 71 | 71 |
| Global Renewables (UR3R) | 71 | 71 |
| EarthPower Technologies | 59 | 71 |

Source: Environment Protection Authority, SA Government Consultancy report: Alternatives to landfill - cost structures and related issues, Allen Consulting Group analysis

Further, the establishment of AWTs involves considerable capital costs and long operational timeframes. The risks and uncertainties with payoff periods, financial viability and the policy environment add further complexity to the establishment of AWTs. For these reasons, the gate fees for disposal of material at these types of facilities tend to be higher than the equivalent disposal fee at a landfill (GHD 2009).

However, as part of the Australian Government's renewable energy target (20 per cent of Australia's electricity coming from renewable sources by 2020) certain wastes or fractions of a waste stream could be considered a renewable energy source and therefore may be used to achieve the target. This may influence investment in this area and could lead to increased use of AWTs.

While increasing the Levy will increase landfill costs, and therefore should make AWTs more viable, this will not necessarily be the case for each Levy increase. This is because a certain threshold or minimum price level may be required to be reached before a specific technology becomes viable. Therefore any Levy increase that does not increase the cost of landfill to this point will not induce the usage of such a technology.

### 4.4 Other market impacts

The Solid Waste Levy is the primary tool to induce increased resource recovery in South Australia and mitigate the costs of sending waste to landfill. While there are considerable environmental benefits of increasing resource recovery, there are also numerous market benefits of increasing resource recovery. Increased resource recovery can:

- create new businesses to transport, process, manufacture and redistribute the recovered resources;
- lead to additional jobs being created due to the labour intensive nature of resource recovery;
- increase the productivity of businesses, through enhanced efficiency in relation tot he use of materials; and
- transfer economic activity from jurisdictions that are engaged in developing virgin resources to SA.

For example, it has been estimated that recycling generates 9.2 jobs per 10,000 tonnes of waste recycled relative to 2.8 jobs for landfill disposal (DEWHA 2010, p. 228). As such, it is estimated that between 330 and 360 additional jobs could be created as a result of changes to the Levy (see table below). It is noted that these employment opportunities might not be reached in the short term. Rather they are a reflection of what may happen in the longer term as the waste industry adjusts to the levy changes.

Table 4.4

**WASTE SECTOR EMPLOYMENT IMPACTS**

| Scenario | Impact on landfill employment | Impact on resource recovery employment | Net employment impact |
|---|---|---|---|
| Scenario 1 | 167 | 542 | 375 |
| Scenario 2 | 141 | 457 | 317 |
| Scenario 3 | 155 | 504 | 349 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

These benefits have not been quantified here. In addition, these benefits are not likely to be realised until the medium to long-term and lie outside the scope of this analysis.

## 4.5 Summary of market impacts

The principal market shift of the Levy changes is a move away from waste to landfill to the resource recovery process. Resource recovery increases (waste to landfill decreases) under each of the Scenarios assessed. Changes to the Levy have the potential to result in the salvaging of between 50 to 60 thousand additional tonnes in 2014-15 of valuable economic resources that would otherwise be disposed of.

Scenario 1 has the greatest impact on the volume of resource recovery, increasing by nearly 1.9 per cent. Under this Scenario, the Levy increases are the most consistent across all sectors and regions.

Resource recovery increases in the other Scenarios, but to a lesser extent. Scenario 2 has the lowest impact on the amount of waste sent to landfill, reducing waste sent to landfill by 5.7 per cent. This is a result of a significant proportion of landfill (MSW- which makes up 30 per cent of landfill) not being subject to any increases in the Levy, relative to the baseline case.

A range of other market impacts may also result from increased resource recovery. It is estimated, for example, that between 317 and 375 additional jobs could be created as a result of changes to the Levy.

Although the Levy increases can be expected to generate some considerable benefits, it is unlikely that all waste diversion targets set in South Australia's Waste Strategy will be achieved. The effectiveness of the Levy appears to be limited, particularly in the short run, and may benefit from the support of additional complementary measures. Related to this, stakeholders were particularly vocal about increases in the Levy while significant monies in the Waste to Resources Fund remain unspent.

*Chapter 5*

# Environmental impacts

By diverting waste away from landfill, the Levy helps reduce many of the negative environmental costs associated with landfill. This includes increased resource recovery, increased diversion rates, reductions in greenhouse gas emissions, as well as other environmental impacts.

The key environmental impact of the Levy changes was identified in the previous chapter. Between 50 and 60 thousand additional tonnes of waste could be diverted away from landfill to resource recovery processes each year. The materials recovered through this process no longer need to be mined, processed or otherwise manufactured. The focus of this chapter is on the additional environmental impacts of the proposed Levy changes — and these impacts are quantified where possible.

## 5.1 Preservation of natural resources

Resource recovery salvages waste products and converts these into materials that can be used throughout the economy. In doing so, resource recovery processes preserve natural resources and generate significant environmental benefits.

Benefits accrue from reduced mining and processing of virgin resources that is required to replace disposed materials. As discussed in Section 2.3, through the process of resource recovery the amount of virgin resources required for extraction and processing for the production of new products is reduced considerably. The environmental benefits for reduced manufacturing and decreased reliance on virgin resources include for example:

- increased water and energy savings;
- decreased greenhouse gas emissions; and
- conservation of non-renewable resources.

A recent Australian study found that the avoided environmental cost of manufacturing generated through kerbside recycling can be up to 20 times greater relative to the environmental cost of collection and disposal of material (North East Waste Forum, 2011).

In addition, the reuse of materials through the resource recovery process lowers the volume of waste sent to landfill and extends the life of landfill sites. This in turn reduces the need for additional landfill sites to be built.

## 5.2 Greenhouse gas and other airborne emissions

Greenhouse gas emissions are recognised by most studies as the largest and most variable component of total externality costs. Table 5.1 below presents greenhouse gas externality estimates for Australia from two recent studies. The table also considers the estimated damage cost of carbon measured in these studies, calculated in units of 'carbon dioxide equivalent' ($CO_2$-e).

Table 5.1

**GREENHOUSE GAS EXTERNALITY COSTS PER TONNE OF LANDFILL WASTE**

| Study | Range (2010 $) | Expected damage cost of carbon ($ per tonne of CO2-e) |
|---|---|---|
| Productivity Commission (2006) | 0 – 16.67 | 5.56 – 22.23 |
| BDA Group (2009) | 4.09 – 13.29 | 40.00 |

Source: Schollum 2010, p. 28

Several factors affect the variation in estimates of greenhouse gas externalities, such as the:

- composition of waste;
- quantity of emissions per tonne of waste; and
- rate of landfill gas capture (Schollum 2010, p. 28).

Most of the inconsistency however is due to the difficulty of measuring the damage cost of greenhouse gas emissions. Higher estimates of the expected damage cost of carbon often result in higher estimates of greenhouse gas externality costs. Additionally, a broader range in the expected damage cost of carbon tends to lead to greater variability in externality measurements (Schollum 2010, p. 28).

Table 5.2 outlines the potential reduction in GHG emissions associated with decreasing GHG associated with sending waste to landfill under each Scenario. Depending on its source, it has been estimated that a tonne of landfill can have an emissions intensity of 0.2 (for the C&D sector), 1.1 (for the C&I sector), and 1.2 (for MSW)[12]. Increases in the Levy could reduce GHG emissions by up to an additional 35 thousand tonnes each year (Scenario 1). This quantum again decreases the more leakage/exemptions are applied to the Levy, as occurs under the other Scenarios.

Table 5.2

**GHG ABATEMENT, DEVIATION FROM BASELINE ('000 TONNES)**

| Scenario | 2013-14 | 2014-15 |
|---|---|---|
| Scenario 1 | 33.2 | 34.8 |
| Scenario 2 | 22.6 | 23.6 |
| Scenario 3 | 28.5 | 30.0 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

[12] Data provided by ZWSA, based on the National Waste Report.

Landfills also emit traces of other air pollutants that can be harmful to the environment and human health. These pollutants include for example:

- volatile organic compounds (VOCs);
- nitrogen dioxide;
- sulphur dioxide;
- benzene;
- hydrogen sulphide; and
- mercury and fine particles (Schollum 2010, p. 31).

The majority of estimates for these externalities are fairly small due to the low quantity of emissions and lower population levels near landfill sites. The Productivity Commission values air emission externality costs as below $1 per tonne of waste (Schollum 2010, p. 31).

## 5.3 Other environmental impacts

In addition to GHG abatement, there are several other environmental benefits associated with reducing the amount of waste sent to landfill. These are discussed in detail below.

### *Leachate*

Leachate can potentially consist of metals, organic and inorganic compounds, including toxins and occurs as a liquid in landfills resulting from precipitation and surface water combining with the physical and biochemical breakdown of waste. Leachate can be harmful to human health and the environment if it enters into soil and groundwater from landfills, and especially in the event that it contaminates the food chain or drinking water (Schollum 2010, p. 31-32)

Numerous studies, including the Productivity Commission state that these adverse environmental impacts are difficult to value due to the lack of existing research into the effects of leachate and its potential to escape from landfills and into the environment (Schollum 2010, p. 32). However these studies concur that when landfills are properly designed and managed, the externality values of leachate are generally small.

A landfill that is lined with clay and/or plastic can prevent or reduce the incidence of leachate escaping, and it can also be collected and pumped out of landfills into sewers for treatment.

### *Dis-amenity*

Dis-amenity costs exist only when a landfill is located in a populated area or one used for recreation and do not vary depending on the levels of waste in landfills. The scale of these fixed costs are measured by a landfill site's characteristics (Schollum 2010, p. 32). The hedonic price method (HPM) is frequently used to calculate dis-amenity effects of landfill sites, which assumes that a good's value is determined from the valued characteristics of the good (Schollum 2010, p. 22)

In terms of residential property, its value is derived from its attributes (such as number of rooms), the neighbourhood and environmental features. Estimation of hedonic price functions are broadly used to determine the value that individuals place on environmental features such as distance from a landfill and air quality, from differences in property prices at various distances from landfill sites (Schollum 2010, p. 22-23).

The New South Wales Environment Protection Agency (EPA) estimates that property prices for houses located within two kilometres from landfills would be between approximately zero and one per cent lower and that dis-amenity costs can potentially be as high as $3.70 per tonne of waste. For landfills that are properly located, engineered and managed, the Productivity Commission estimates that the dis-amenity value is less than $1 per tonne of landfilled waste (Schollum 2010, p. 33).

#### *Other externalities*

There are a range of other externalities associated with sending waste to landfill or resource recovery. For example, transport externalities that are associated with trucks that collect waste cause noise, contribute to congestion and air pollution and increase the risk of accidents. Factors that affect the relative size of these externality costs include:

- truck size;
- fuel efficiency of trucks;
- distances travelled;
- number of stops made; and
- population density along trucks' routes (Schollum 2010, p. 34).

It is unclear how the diversion of waste to landfill to resource recovery will impact on these externalities. Many Australian studies, including the Productivity Commission, omit transport costs from their calculation of external costs of landfill. The Productivity Commission concludes that the costs of transport are increased due to insurance and therefore internalise some of the property damage costs associated with accidents. It also draws attention to regulations to reduce vehicle emissions, further increasing costs of transport and are assumed to reduce damage through pollution (Schollum 2010, p. 35).

### 5.4 Summary of environmental impacts

By diverting waste away from landfill, increases in the Levy are able to achieve some considerable environmental benefits, including increased resource recovery, increased diversion rates, reductions in greenhouse gas emissions, as well as other environmental impacts.

The key environmental impact of the Levy changes are an increase of between 50 and 60 thousand additional tonnes of waste diverted away from landfill to resource recovery processes each year, as discussed in the previous chapter.

Increases in the Levy could also reduce GHG emissions by around 35 thousand tonnes each year (Scenario 1). This quantum again decreases the more leakage/exemptions are applied to the Levy, as occurs under the other Scenarios.

A range of other externalities are also associated with sending waste to landfill. For example, transport externalities that are associated with trucks that collect waste cause noise, contribute to congestion and air pollution and increase the risk of accidents. Similarly, as mentioned above, there are also indirect benefits that accrue from avoided mining and other processing of virgin resources to replace disposed materials. Although significant in their own right, these impacts have not been quantified in this analysis.

*Chapter 6*

# Social impacts

The distribution of how changes in the Levy are likely to affect different sectors in the community was not considered in the assessment of market impacts (beyond the landfill and recovery sectors).

If the Levy increases, industry, businesses and households (councils) will face increased costs since they are all generators of waste. However, these sectors will be affected in different ways, whether it is directly, as in the case of industry, or indirectly, as in the case of households.

This section provides a discussion on how each of the scenarios might affect:

- the SA Government;
- the Local Government sector;
- industry;
- business; and
- households.

## 6.1 The South Australian Government

Changes to the Levy have two main impacts on the State Government. Firstly, changes to the Levy will impact on the ability of the SA Government to meet its identified targets for the reduction of waste. Secondly, changes to the Levy will affect how much revenue the Government receives from its collection.

An important consideration for the State Government in relation to the Levy, is the use of Levy funds. While it is known that half of the funds generated are used by other government agencies, 50 per cent of the Levy collected is distributed by ZWSA. ZWSA uses this money to establish measures, which complement the use of the Levy at diverting waste to landfill. As such, changes to the Levy and corresponding increases received will raise the question of what these funds are to be used for.

Currently, stakeholders noted that the Waste to Resources Fund has a significant amount of money in reserve and it was suggested that this money should be used to increase the amount of waste diverted from landfill through complementary measures. With additional revenue being raised in each Scenario the use of the additional funds will need to be considered by the State Government and its statutory bodies.

Stakeholders also noted that they believed the EPA was under resourced to enforce current policy and legislation. With changes to the Levy and the potential for increased illegal dumping, stakeholders suggested that additional resources would be required. Another issue raised in stakeholder consultations was a concern with State Government policy grey areas, such as definitional issues. Changes to the Levy could exacerbate these concerns, which may impact on the State Government.

In all of the Scenarios examined there is an increase in the level of revenue generated by the Levy relative to the baseline case. However, the amount of additional revenue generated under each Scenario differs, as seen in Figure 6.1 and Table 6.1. Scenario 1 generates the most additional revenue, $7.7 million, which would bring the total revenue received to $38.8 million.

Table 6.1

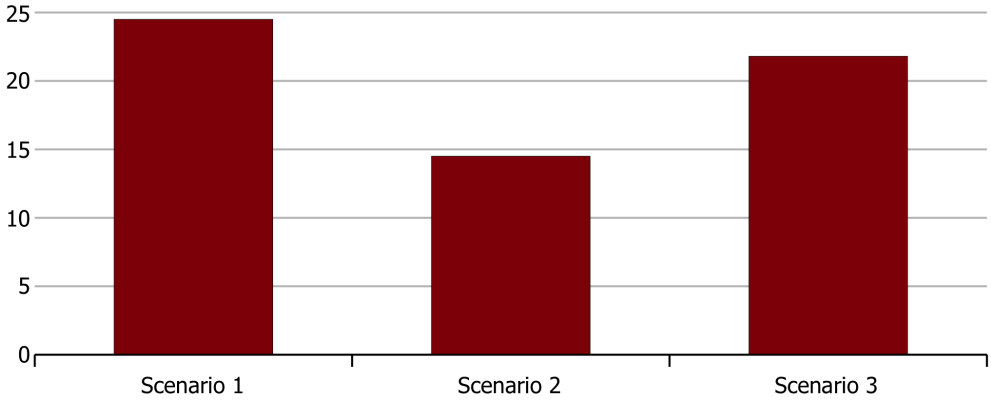
**REVENUES, DEVIATION FROM BASELINE ($ MILLION)**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Scenario 1 | 7.5 | 7.7 |
| Scenario 2 | 4.5 | 4.5 |
| Scenario 3 | 6.7 | 6.8 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

Figure 6.1

**REVENUE, PERCENTAGE CHANGE FROM BASELINE, 2014-15**



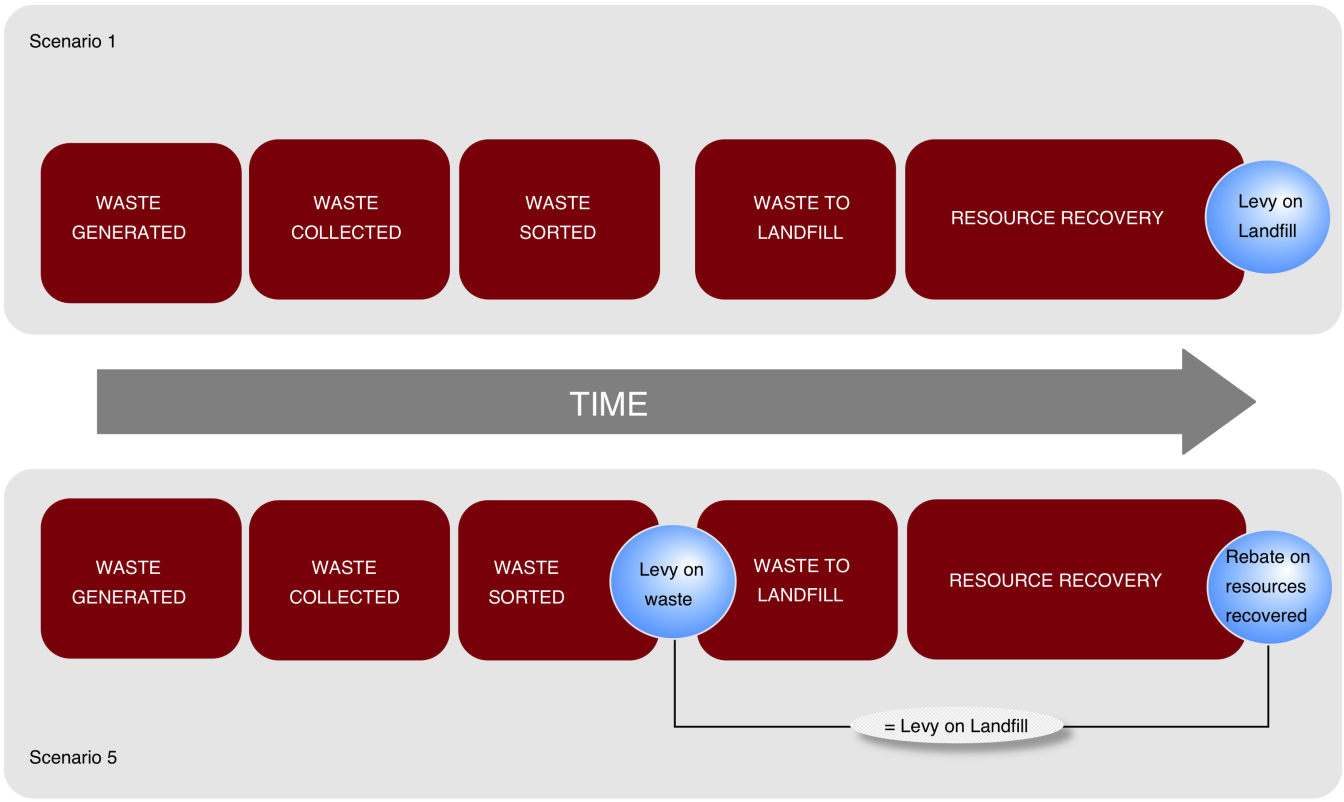

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

Revenue increases by the greatest amount under Scenarios 1 and 4, increasing by nearly 25 per cent in 2014-15. This is a result of a higher Levy being charged for all sectors and geographical areas under this Scenario.

Importantly, there is a timing issue that differentiates Scenarios 1 and 4 (see Figure 6.2). Under Scenario 1, the Levy is applied on landfill regardless of how long the resource recovery process takes. Under Scenario 4 however, the Levy is applied to all waste received and rebated once resource recovery has been completed. The net effect is to transfer working capital from the private sector to the SA Government for the duration of the recovery process. Notably, this could be after a significant period of time. Stakeholders identified several stockpiles of recovered waste-fill materials that had been awaiting a market for over a decade. Further, these stockpiles were estimated to grow in the vicinity of 200 thousand tonnes per annum.

Figure 6.2

**TIMING IMPLICATIONS OF SCENARIOS 1 AND 4**




Source: The Allen Consulting Group.

The changes in the Levy associated with each Scenario have differing impacts on each of the sectors. The main impacts on each sector are:

- **Metropolitan** — In metropolitan Adelaide Scenario 1 and 3 lead to and increase of revenue by around 24 per cent, while in Scenario 2 received from metropolitan Adelaide is increased by 14 per cent relative to the baseline case.
- **Non-metropolitan** — Scenario 1 and 2 increase revenue generated from metropolitan Adelaide, with revenue increased by 30 per cent and 19 per cent respectively. Under Scenario 3 revenue does not differ from the baseline, reflecting the same Levy amount charged.

- **MSW** — Scenario 2 does not change the level of revenue received from MSW relative to the baseline. However, under Scenario 1 and 3, revenue is increased by 30 and 27 per cent, respectively.
- **C&I** — Revenue received from the C&I sector increases under all Scenarios, ranging from a 26 per cent increase under Scenario 3, to a 29 per cent increase under Scenarios 1 and 2.
- **C&D** — The changes to the Levy under all the Scenarios have a relatively similar impact on revenue generated from the C&D sector, ranging from an increase of 3per cent under Scenario 3 to 5 per cent under Scenario 1 and 2.

The economic impact of Levy changes for the State Government is reflected by changes in revenue received. While increases in the Levy reduce the amount of waste sent to landfill and hence lower State Government revenue, the increase in the Levy charged on the remaining waste sent to landfill offsets this under all Scenarios.

Changes to the Levy will also affect the amount of revenue received by the Commonwealth Government under the CPM. The impact on Commonwealth Government revenues is outlined in Box 6.1.

Box 6.1

**COMMONWEALTH GOVERNMENT REVENUES**

The Commonwealth Government will receive revenue associated with the implementation of the CPM. As discussed earlier in this report, gate prices charged for landfill are made up of private costs, levy charges and the cost of the CPM. Therefore the greater the amount of waste sent to landfill, the greater the associated revenue for the Commonwealth Government.

As a result, the Commonwealth Government will receive greater revenue under the Scenarios with greater amounts of waste sent to landfill. Revenue received by the Commonwealth Government in 2014-15 ranges from $12.2 million in Scenario 1 to $12.8 million in the baseline case, as illustrated in the table below.

| Scenario | 2013-14 ($ million) | 2014-15 ($ million) |
|---|---|---|
| ***Baseline*** | ***12.4*** | ***12.8*** |
| Scenario 1 | 11.9 | 12.2 |
| Scenario 2 | 12.0 | 12.4 |
| Scenario 3 | 12.0 | 12.3 |

*The revenue received by the Commonwealth Government has been calculated based on net liable emissions and a carbon price that increases inline with inflation.

The Commonwealth Government receives the greatest amount of revenue under the Baseline case, which sees the greatest amount of waste is sent to landfill. The Commonwealth Government receives the lowest revenue under Scenarios 1 and 3. It is noted that while Scenario 2 has a lower amount of landfill than Scenario 3 the greater revenue is due to the composition of the waste sent to landfill. In Scenario 2 a greater percentage of waste is MSW, which has greater emissions per tonne than C&I and C&D and therefore attracts greater costs under the CPM.

Source: The Allen Consulting Group

## 6.2 Local Government

Local Governments spend a significant proportion of their funds on waste and related activities. The 68 Councils in SA spend around $1 billion a year, with waste and recycling in particular making up 10 per cent of total council expenditure (Local Government Association of South Australia 2007). The effects of Levy changes on Local Government are based on changes to operating costs associated with Levy changes. Since Local Government's collect MSW and send a proportion of it to landfill, they incur increased costs associated with Levy increases.

Local Governments can influence the amount of waste sent to landfill through their activities, such as promotion of awareness of recycling issues, education campaigns to reduce contamination and systems in place to collect waste such as three bin systems and the collection of food waste. However, it was noted by several stakeholders that Local Government does not have a direct influence on the amount of waste generated.

Stakeholders suggested that this issue is exaggerated by the fact that some Local Government Areas are achieving near capacity diversion rates, and as such any increase in the Levy will have a marginal effect on waste sent to landfill. It was advised, however, that there is a significant range of diversion rates currently being achieved by Local Governments, with diversion rates in metropolitan and regional areas ranging from 39 per cent to 62 per cent. In some remote areas, resource recovery is not occurring at all and hence diversion rates are at 0 per cent.

Local Government's performance in relation to waste diversion from landfill is variable. The differences are said to be due to different circumstances in different areas, such as the systems in place to recover resources and density issues. By addressing these issues to ensure that Local Government's are performing at, or near, capacity there may be significant gains to be made in terms of waste diverted from landfill.

In addition, it was also noted that the type of waste significantly affects the ability for recovery and the associated costs. It was advised that some waste types such as e-waste and food waste are expensive to recover, with estimates of the cost of recovering these items at between $700-$1000 and $200 a tonne respectively.

It was also suggested that there are opportunities to reduce waste sent to landfill in cost neutral ways. One such example, which was bought to the attention of this review, was the establishment of fortnightly pick-ups instead of weekly collection. It was suggested that the resulting decrease in costs would then allow Local Government to undertake other activities such as the collection of food waste. In this instance increase waste would be diverted from landfill whilst costs would be maintained at similar levels.

Additionally, it was noted that Local Government needs time to adjust to Levy changes, as the ability to respond is limited if changes occur in short time frames. This raised concerns as many contracts have Levy charges built into them when they are agreed and changes with short timeframes mean that these contracts do not take into account cost increases. Further, stakeholders suggested that the more money spent on paying the Levy the less money can be spent on other measures to reduce waste to landfill. However, it should be noted that this assumes that increases in the Levy are not passed on to households through rates rises, and therefore the funds available for these measures are reduced.

Levels of illegal dumping are a concern for Local Government. If the levels of illegal dumping increase due to changes in the Levy, Local Government may sustain additional costs. It was noted by stakeholders that the Local Government incurs costs on two levels when dealing with illegal dumping. Firstly, the local government has to pay the costs associated with cleaning up the waste and then incurs further costs of sending the waste to landfill. It was suggested that this was onerous on Local Government and if illegal dumping were to increase this would lead to higher costs.

Under all the Scenarios examined there is a limited effect on the volume of MSW sent to landfill, relative to the baseline case as seen in Table 6.2. The Levy changes have between a 0-3 per cent impact on MSW sent to landfill. Since it is anticipated that the amount of MSW sent to landfill will not be reduced significantly, Local Governments will face increased costs due to increases in the Levy, without significant reductions in waste volumes.

Table 6.2

**EXPECTED MSW DIVERSION RATES FOR WASTE IN 2014-2015**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Baseline | 58.0 | 58.1 |
| Scenario 1 | 59.3 | 59.5 |
| Scenario 2 | 58.1 | 58.2 |
| Scenario 3 | 59.1 | 59.3 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

The impact of Levy changes are based on increased costs associated with the increased Levy amounts charged for MSW going to landfill. The Levy presents a significant cost to the Local Government sector, (for example, under Scenario 1, the total cost for Local Government will be approximately $13.5 million), which can some extent be mitigated by increased diversion rates. The net impact is presented in Table 6.3.

Scenario 1 has the greatest impact on Local Government, followed by Scenario 3, with increased costs of $3.1 million and $2.8 million respectively in 2014-15. This occurs in these Scenarios due to the Levy on MSW increasing by the greatest amount. Scenario 2 has no economic impact relative to the baseline, reflecting the fact that the Levy amount is the same for MSW.

Table 6.3

**LOCAL GOVERNMENT WASTE DISPOSAL COSTS, DEVIATION FROM BASELINE ($ MILLION)**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Scenario 1 | 3.0 | 3.1 |
| Scenario 2 | 0.0 | 0.0 |
| Scenario 3 | 2.7 | 2.8 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

## 6.3 Commercial and industry

During consultations a number of stakeholders made the point that organisations, particularly large businesses and industry, are facing increased costs in the current operating environment. Within this context it was noted that organisations are seeking to minimise costs and that many businesses were working hard to reduce the associated costs of sending waste to landfill. In light of this, it was suggested that increases in the levy would not have a significant impact on the amount of waste sent to landfill from the commercial and industry sectors. It was also noted that many large organisations, such as large hotels, supermarket and restaurants had established sustainability policies and practices and their activities are aligned with these. As such, corporate policy influences their actions to a large extent.

For some organisations, such as smaller businesses and charities, it was suggested that there might be some additional diversion possible. However, it was noted that, since these businesses do not generate large amounts of waste and therefore do not have large costs associated with waste generation, there is a lack of incentives to reduce waste to landfill. It was also suggested that in addition to this lack of incentive, a low level of education means that contamination levels, particularly in C&I waste, are a significant issue. As discussed, high levels of contamination reduce the amount of waste able to be recovered and increase costs for recyclers. These costs ultimately flow back to the waste generators.

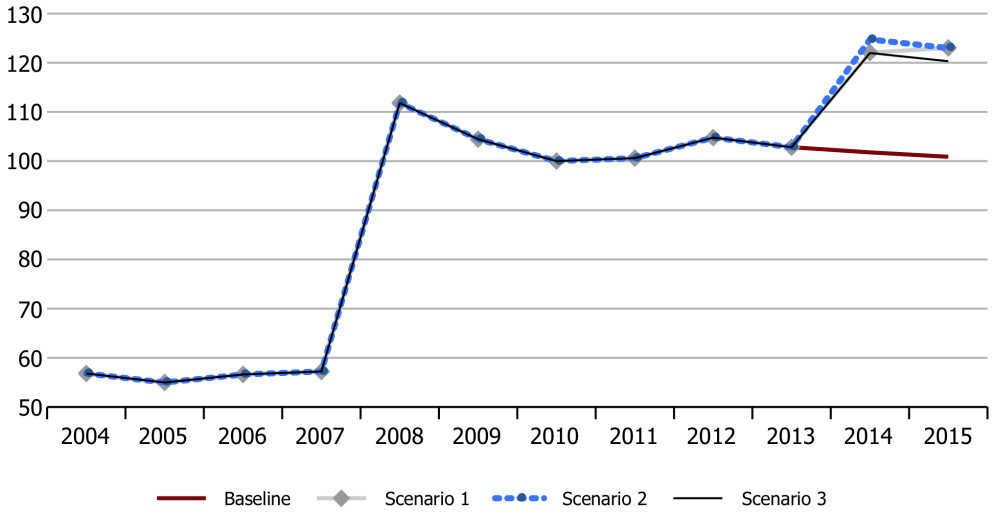
The cost to organisations, which generate low levels of waste, of planning and implementing strategies to reduce waste to landfill may exceed the costs saved, which further reduces the incentives to reduce waste to landfill. Additionally, the large number of environmental accreditations, standard and programs were said to be becoming particularly onerous with businesses getting lost in the multitude of sustainability and environmental standards and accreditation processes. It was suggested by stakeholders that, in order to increase diversion rates for these organisations, complementary measures in addition to the Levy are required.

In relation to alternatives to waste, stakeholders commented that all businesses are highly price responsive and will look to minimise their costs where possible. As such, they will predominately look to reducing costs, which has a large influence on their behaviour.

One way to identify the impact on the commercial sector is to consider the ratio of Levy payments by C&I and C&D relative to SA's GSP. This ratio is plotted as an index in the figure below. Relative to 2010, businesses might expect their waste disposal costs to increase by up to 30 per cent (to a level that is more than double 2007 costs).

Figure 6.3

**INDEX OF C&I AND C&D LEVY PAYMENTS RELATIVE TO GSP**




Source: The Allen Consulting Group

While this is a large increase in relative terms, in an absolute sense the impact will be minor for the vast majority of firms.

Alternatively, the impact of the Levy can be measured per business. SA is home to around 53,000 firms with greater than one employee (Australian Bureau of Statistics, 2011a). The impact of changes to the Levy can be estimated by calculating the additional costs incurred by these businesses under each Scenario. The additional cost per business of Levy changes under each Scenario is outlined in Table 6.4. This is a relatively crude measure as firms are of different scales, and produce waste at different magnitudes. Under all scenarios, the impact to business is relatively similar. This is occurs due to the Levy changes being dispersed across all businesses, therefore reducing their significance.

Notably, though, the cost to business of sending waste to landfill will be greater than outlined in the table, as businesses will be required to pay the carbon price, which has not been taken into consideration here.

Table 6.4

**AVERAGE IMPACT ON BUSINESS, DEVIATION FROM BASELINE ($ PER BUSINESS)**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Scenario 1 | 86.2 | 86.7 |
| Scenario 2 | 86.4 | 86.6 |
| Scenario 3 | 76.0 | 76.1 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

Importantly, this measure simply averages the cost per business. For those businesses, which generate large amounts of waste, the impact to their costs may be significantly higher. Table 6.5 examines the impact of each Scenario on indicative small and large businesses. These figures have been calculated by estimating the additional cost associated with levy changes per employee across South Australia. This increase per employee has then been used to estimate the additional cost for a small business (with 10 employees) and a large business (with 220 employees). As anticipated, the larger the business (in terms of employees) the greater the cost per business.

Table 6.5

**INDICATIVE IMPACT ON BUSINESSES, DEVIATION FROM BASELINE ($ PER BUSINESS)**

| | 2013-14 | | 2014-15 | |
|---|---|---|---|---|
| Business size | Small (10 employees) | Large (220 employees) | Small (10 employees) | Large (220 employees) |
| Scenario 1 | 50.77 | 1117.00 | 51.05 | 1123.19 |
| Scenario 2 | 50.87 | 1119.20 | 51.00 | 1122.02 |
| Scenario 3 | 44.76 | 984.66 | 44.81 | 985.88 |

Note: The figures have been estimated for indicative businesses only and are likely to vary for each individual business based on different business characteristics. These figures have been estimated by calculating the cost of Levy changes per employee. This has then been used to calculate the additional cost for each indicative business, based on the identified number of employees.
Source: The Allen Consulting Group.

## 6.4 Households

Since households generate waste in the form of MSW, increases in the Levy will increase the costs of generating waste for households. However, Local Government is responsible for the collection and disposal of waste and hence pays the Levy. This means that increases in the Levy will not directly increase costs for households. Households will be affected by Levy changes if Local Governments pass the increases on by increasing rates.

The per household costs of the Levy have been estimated in Table 6.6. The table estimates this impact by dividing the cost of MSW landfill by the number of SA households.

In 2014-15, Scenarios 1 and 3 increase the cost of disposing of waste for households relative to the baseline case by $4.40 and $4.00 per household, respectively. Scenario 2 has no impact reflecting the fact that under this Scenario there are no increases in the Levy applicable to MSW.

Relative to today however, the total cost to households of sending waste to landfill may be greater than outlined in the table, as Local Government will also be required to pay the carbon price.

Table 6.6

**IMPACT ON HOUSEHOLDS, DEVIATION FROM BASELINE ($ PER HOUSEHOLD)**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Scenario 1 | 4.4 | 4.4 |
| Scenario 2 | 0.0 | 0.0 |
| Scenario 3 | 3.9 | 4.0 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

It was suggested by stakeholders that since households do not directly face cost increases associated with Levy increases, the incentive to reduce waste sent to landfill is not high. Additionally, even if households realise the increased costs they are paying, these costs are so small they would not alter their behaviour significantly. It was suggested that to promote further diversion of waste from landfill that education campaigns were needed. These campaigns would be particularly important in reducing the contamination levels of MSW.

## 6.5 Summary of social impacts

Any increase in the Levy will impose increased costs on the generators of waste — affecting industry, businesses and households, whilst also impacting on the revenue received by both the South Australian and Commonwealth Government. The extent to which each sector will be affected will differ depending on whether that sector observes the price signal directly (as in the case of industry) or indirectly as in the case of households. The main social impacts include:

- SA Government — In all of the Scenarios examined there is an increase in the level of revenue generated by the Levy relative to the baseline case. However, the amount of additional revenue generated under each Scenario differs from $7.7 million under Scenario 1, which would bring the total revenue received to $38.8 million to $4.5 million under Scenario 2, bringing the total revenue to $35.7 million under this Scenario.

- Commonwealth Government — Revenue received by the Commonwealth Government in 2014-15 ranges from $12.2 million in Scenario 1 to $12.8 million in the baseline case.
- Local Government — The Levy presents a significant cost to the Local Government sector, (for example, under Scenario 1, the total cost for Local Government will be approximately $13.5 million), which can some extent be mitigated by increased diversion rates.

  – Scenario 1 has the greatest impact on Local Government, followed by Scenario 3, with increased costs of $3.1 million and $2.8 million respectively in 2014-15. Scenario 2 has no economic impact relative to the baseline, reflecting the fact that the Levy amount is the same for MSW.
- Commercial and industry — In 2014-15 the additional cost per business, relative to the baseline case, ranges from $76.10 (under Scenario 3) to $86.70 under Scenario 1.
- Households — In 2014-15, Scenarios 1 and 3 increase the cost of disposing of waste for households relative to the baseline case by $4.40 and $4.00 per household, respectively. Scenario 2 has no impact reflecting the fact that under this Scenario there are no increases in the Levy applicable to MSW.

*Chapter 7*

# Discussion and conclusions

This final chapter outlines the key impacts of changes to the Solid Waste Levy. It provides a summary of the market, environmental and social impacts of the Levy changes, and outlines the net impacts of each Scenario. It also examines the relative strengths of the options considered, as well as exploring additional issues raised during the review.

A key objective of the Levy is to encourage resource recovery throughout SA. In the baseline case, the overall diversion rate in the baseline case increases from 72.2 per cent in 2011-12 to 77.7 per cent in 2014-15 as a result of Levy changes and the CPM. Under all of the Scenarios examined additional diversion is generated.

In all Scenarios examined, an increase in the Levy leads to a substantial increase in the amount of waste diverted away from landfill towards resource recovery in the longer term. In doing so, resource recovery process generates significant economic and environmental benefits. Economic benefits from resource recovery include:

- creating new businesses, investment and employment[13] to transport, process, manufacture and redistribute the recovered resources;
- additional jobs being created due to the labour intensive nature of resource recovery;
- prolonging the useful life of landfill which frees up land that could provide a better economic return;
- increased productivity of businesses, through enhanced efficiency in relation to the use of materials; and
- the transfer of economic activity from jurisdictions that are engaged in developing virgin resources to SA.

Similarly, the environmental benefits of resource recovery relate to:

- conserving finite natural resources;
- reducing the environmental impacts and greenhouse gas emissions associated with the extraction and processing virgin resources; and
- reducing the environmental harm of waste to landfill.

Recognising the wide range of impacts changes to the Levy may impose, this assessment has considered the market, environmental and social impacts of changes to the Levy. The scenarios modelled as part of this analysis estimate that:

[13] Some practitioners do not consider resource recovery a wealth creating activity but rather it transfers investment and employment from one sector to another. Sustainable development practitioners argue that growth in the resource recovery industry is a desirable outcome as investment and employment is transferred to more sustainable industry sectors (that is, resource recovery). This in turn, helps facilitate the transition to a more sustainable economy that as it prolongs the useful life of finite resources.

- South Australia's diversion rate could increase to 79.2 per cent by 2014-15;
- between 50 and 60 thousand additional tonnes of waste could be diverted away from landfill to the resource recovery processes each year;
- direct greenhouse gas emissions associated with landfill could be reduced by between 23 and 35 thousand tonnes per year[14]; and
- up to an additional $7.7 million in revenues could be raised for the South Australian Government each year (under Scenario 1).

Across the state, it is estimated that the proposed changes will have only a minimal impact on business, industry and household sectors.

## 7.1 Summary of impacts

Changes to the Solid Waste Levy result in various economic, environmental and social costs and benefits. By quantifying these impacts (see Appendix E) an overall assessment of the net impact of the Scenarios examined can be undertaken. This is in line with the Regulatory Impact Statement requirements in South Australia, which require a cost benefit analysis to be undertaken when agencies are proposing to introduce new regulation or review or amend existing regulation.

A summary of the overall market, environmental and social impacts of the assessed changes to the Solid Waste Levy, as well as the net impact of each Scenario is outlined in Table 7.1.

Under all Scenarios, the economic costs of diverting waste to resource recovery outweigh the economic benefits of diverting waste from landfill. While to some extent this is negated by the quantifiable environmental impacts, under all Scenarios the Levy changes lead to net economic costs.

[14] This figure does not include GHG savings resulting from a reduction in the use of virgin resources.

Table 7.1

**SUMMARY OF IMPACTS, 2014-15**

| Impact | Units | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|
| Market impacts | | | | |
| Net economic impact* | $ millions | -0.24 | -0.53 | -0.35 |
| *—Cost of increased resource recovery* | *$ millions* | *9.05* | *7.63* | *8.41* |
| *—Savings on reduced landfill* | *$ millions* | *7.82* | *6.38* | *7.18* |
| *—Avoided environmental externalities caused by landfill*** | *$ millions* | *0.99* | *0.72* | *0.87* |
| Change in waste sector employment | Persons | *375* | *317* | *349* |
| Environmental impacts | | | | |
| Additional tonnes of waste diverted to resource recovery | 1000 tonnes | 59.6 | 50.2 | 55.4 |
| Avoided landfill GHG emissions | 1000 tonnes | 34.8 | 23.6 | 30.0 |
| Diversion rate | Per cent | 79.2 | 78.9 | 79.1 |
| Change in diversion rate (relative to baseline) | Percentage points | 1.5 | 1.3 | 1.4 |
| Social impacts | | | | |
| Increase in Local Government costs | $ millions | 3.1 | 0.0 | 2.8 |
| Average increase in business costs | $ per business | 86.7 | 86.6 | 76.1 |
| Households | $ per household | 4.4 | 0.0 | 4.0 |
| Revenue impacts | | | | |
| Total SA Government revenue raised from Levy | $ millions | 38.8 | 35.7 | 38.0 |
| *—Change in SA Government revenue* | *$ millions* | *7.7* | *4.5* | *6.8* |
| Total Commonwealth Government revenue raised from CPM and landfill | $ millions | 12.2 | 12.4 | 12.3 |
| *— Change in Commonwealth CPM revenue* | *$ millions* | *na* | *na* | *na* |

*This has been calculated as the total quantified benefits minus total quantified costs.
*This includes the economic cost of dis-amenity, leachate and GHG as estimated in the literature.
Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

## 7.2 Comparison of options

Changes to the Solid Waste Levy under each Scenario have examined the differing impacts geographically and on each waste sector. These impacts are discussed in detail below.

### *Scenario 1 — General Levy increase*

Scenario 1 involves a step increase in the Levy across all sectors in 2013-14. Importantly, it does not differentiate between the key waste generating sectors of MSW, C&I and C&D. However, it does maintain the disparity between metropolitan and non-metropolitan Adelaide.

This Scenario has the greatest impact on resource recovery, increasing it by nearly 1.9 per cent. It leads to the greatest reduction in GHG emissions and the greatest increase in State Government revenue. However, it has the highest cost for Local Government, businesses and households.

It is the least complex of the Levy changes, and due to its broad nature, is estimated to lead to the lowest levels of leakage and have the lowest risks associated with avoidance.

#### *Scenario 2 — Differential Levy by sector*

Scenario 2 comprises applying a differential levy by waste sector. Specifically, it examines the impact of maintaining the Levy at its current rate (+ CPI) for MSW, while increasing the Levy for the C&D and C&I sectors to $50 in metropolitan areas and $25 in non-metropolitan areas in 2013-14.

Scenario 2 has the lowest impact on resource recovery, increasing it by 1.6 per cent. It has no additional cost to Local Government or households. However, it has the lowest reduction in GHG emissions and the lowest increase in State Government revenues.

Scenario 2 has the lowest impact on the amount of waste sent to landfill, reducing waste sent to landfill by 5.7 per cent. This is a result of a significant proportion of landfill (MSW- which makes up 30 per cent of landfill) not being subject to any increases in the Levy, relative to the baseline case.

An increase in the amount of the Levy charged for contaminated soil was also examined under this Scenario. The impacts of this situation have not been modelled, but rather assessed quantitatively.

Historically, there has been significant reliance in Australia on disposal of contaminated soil to landfill and on management of soil on-site in secure facilities or where appropriate, under buildings, pavements and other structures (Parker 2008). Instinctively, increasing the Levy for contaminated soil would be expected to reduce the amount of contaminated soil sent to landfill. However, there are a number of issues associated with such an increase.

In a similar way to all resource recovery, the technology would need to be available and financially viable at this level to process contaminated soil that would have otherwise being sent to landfill. Without such technology, increasing the Levy will simply add additional costs to those businesses who send contaminated soil to landfill without corresponding gains in reduce volumes.

Further, higher prices may lead to increased levels of illegal dumping. During consultations it was noted that a high proportion of illegal waste dumping included asbestos as it was very expensive to send it to landfill. If increases in the Levy for contaminated soil did result in significant levels of illegal dumping this could have adverse environmental outcomes.

If these Levy changes were to be introduced, significant assistance in the form of complementary measures may be required to assist and encourage processing of contaminated soil, specifically at onsite locations.

### *Scenario 3 — Differential Levy by location*

Scenario 3 involves applying a differential levy by geographical location. Specifically, it examines the impact of increasing the Levy in metropolitan Adelaide to $50 per tonne and maintaining the Levy for non-metropolitan Adelaide at $17.50 per tonne (+ CPI) in 2013-14.

This Scenario has the increases resource recovery by 1.8 per cent and reduces GHG emissions by around 30 thousand tonnes. It also increases State Government revenue by $6.8 million. This Scenario has the second lowest impact on Local Government and households and the lowest impact on business.

The implications of the establishment of a new geographical sector – 'Major Regional Centres' were also considered under this Scenario. This would involve the metropolitan Levy increasing to $50, with a Major Regional Centre Levy of $17.50 and the remaining areas subject to a Levy of $10, $5 or $0. The impacts of this have not been modelled, but rather assessed quantitatively.

According to these geographical divisions, it would be anticipated that the majority of waste would be generated either in Metropolitan Adelaide or in the Major Regional Centres. Since only a relatively small amount of waste generated would be subject to the $10, $5 or $0 Levy, the economic, environmental and social impacts of this would be anticipated to be fairly similar to those modelled under this Scenario.

However, this geographical segmentation could increase the risks associated with leakage and Levy avoidance due to its complex nature and the opportunities it may present for Levy avoidance or reduction, with a potential for a greater incentive to dispose of waste at different locations.

### *Scenario 4 — Rebate scheme*

The impacts of Scenario 4 are not expected to be materially different from Scenario 1. In the immediate term there may be some adverse impacts on incentives, however these may be mitigated through an appropriate transition phase.

The origins of this scheme, it appears, have developed out of concerns of Levy avoidance. While the EPA recognise that there remain some definitional issues outstanding, strictly speaking, the market appears to be broadly compliant with the Act and its Regulations.

The temporary transfer of working capital from the private sector to the SA Government will impose a cost on industry (in the form of reduced liquidity, increased borrowings etc.). In turn, this is likely to be passed on to customers in the Local Government, household and commercial sectors. Moreover, it is unclear how the scheme will impact operator incentives, and the net result may see a reduction in recovery capacity.

While the SA Government will be the beneficiary of this temporary capital transfer, the Government will incur greater administration costs to oversee the new system. Several stakeholders made the point that the data and mechanisms required for this mechanism to operate already existed — and consequently this aspect would not add significant administration costs. However, stakeholders also raised compliance and enforcement issues — which, it was admitted, could increase costs considerably.

On balance, while the mechanism may go a long way to overcome perceived inconsistencies in how the Levy is applied, it appears to be a higher cost and complex mechanism in which to administer the Levy. Should the EPA wish to see these inconsistencies addressed, it may be more appropriate to pursue them directly with stronger policy measures.

## 7.3 Additional issues

In addition to an assessment of the potential impacts of an increase in the Levy, a number of issues emerged from the analysis and the consultation process. These issues are discussed in turn below.

### *Outstanding governance issues*

Neither the *Environment Protect Act 1993*, which establishes the Levy, nor the *Zero Waste Act 2004*, which prescribes how revenues raised from the Levy are to be hypothecated, establishes a clear objective for which the Levy is to pursue. Without a clear definition of the Levy's intent there is a risk that the Levy may be misapplied.

Presumably, the intention of the Levy is to offset the environmental and social costs of waste to landfill and therein assist ZWSA achieve its broader objectives. However, it is clear that in SA, as is the case in other jurisdictions, the Levy also plays a role in revenue generation for the SA Government. In fact, previous increases in the Levy have been pursued to achieve a specified revenue target (see for instance Hyder, 2007).

The risk that this approach runs is that Levy can create additional distortions throughout the economy. This is a critical point raised in the PC's Inquiry into Waste Generation and Resource Efficiency (2006) (Box 7.1 below expands on this issue further). These issues are further compounded by the fact that revenues collected by the Levy lack the transparency and accountability enjoyed by other state taxes, fees and charges.

Box 7.1

**PRODUCTIVITY COMMISSION'S VIEWS ON SETTING A LANDFILL LEVY**

In order to address the market failure associated with landfills, a landfill levy should reflect the external costs that are imposed on the community from landfilling waste. No jurisdiction currently uses landfill levies explicitly to internalise those externalities. Internalising the externalities of disposal may have been the intention in the past in some jurisdictions, such as New South Wales. In that state levies were reset in 1997, apparently to reflect the external costs of landfill disposal (BDA Group and EconSearch 2004). However, that connection has been subsequently lost.

The Department of the Environment and Heritage (DEH) observed:

> Economic arguments are often used to justify levies, but in practice tend to be the least important factor motivating the establishment and quantum of levies. (sub. 103, p. 50)

Examination of various state policy documents as well as submissions received by the Commission reveals that levies are currently used primarily to achieve landfill diversion targets, and to generate revenue for government.

Source: PC 2006.

In addition, the design of the Levy may give rise to poor incentives. How funds collected by the Levy are returned to the community should be determined by a separate agency to that which sets the Levy's value. This is particularly important given the lack of clarity around the Levy's objectives. The principal concern is that as the Levy is collected on waste to landfill, any activity to further reduce landfill tonnage effectively reduces the Levy's base. It follows that the Levy's revenue potential diminishes as a result.

To varying degrees these issues were raised in the consultation process. Stakeholders were particularly vocal about increases in Levy while significant monies in the Waste to Resources Fund remained unspent.

### *Appropriateness of the Levy to address stockpiling*

For some stakeholders the issue of 'stockpiling' and the creation of 'above ground landfills' is a critical issue. The issue of stockpiling refers to mixed waste, predominantly sourced from the C&D sector, which is processed into refined waste-fill material. This material is said to be a 'product awaiting a market.'

Certainly it is appropriate that some stockpiling occurs. Major developments for example may require several hundred thousand tonnes of waste-fill, and it is important that the sector has the capacity to match this demand.

However, a question remains as to how much stockpiling is appropriate. If the recovered material is unable to find a market — the material should be considered waste and disposed of accordingly. Estimates from ZWSA (2011) suggest stockpiles of waste-fill could be as much as 150-200 thousand tonnes a year. Were the current Levy applied to this quantum, the revenues generated could be between $5 and $7 million.

While this is a real concern with real impacts throughout the sector, it is perhaps not appropriate to deal with this issue through the Levy. In the first instance, the mechanism is likely to:

- increase system complexity, compliance requirements and administration costs;
- increase the risk for Levy aversion and gaming;
- stifle legitimate stockpiling activities; and
- provide disincentives for alternative waste-uses (such as in the waste to energy sector).

In the second instance, what is, and what is not defined as waste is clearly a policy issue for the EPA. A disconnect between the Levy and the EPA will be problematic at best, and may be the source of great inconsistencies for other policy fronts. The Levy is most secure when applied simply and broadly.

### *The Levy should encourage highest-value use*

A point was made in the consultation process that the objective of the Levy should not be to seek 'zero waste' for the simple sake of achieving zero waste. Rather, it was argued, that the Levy should be considered as having an important role towards contributing to a broader aim of sustainability.

Certainly, it may be the case that waste to landfill is preferential to resource recovery. For example, the waste to energy sector may be able to produce energy from landfill with a higher value than the market price of say recovered organics or paper products. A similar case might be made for using certain waste products for capping and other landfill operations — once environmental benefits are included.

Diverting landfill *away* from it highest-valued is not a welfare maximising practice. Care should be taken that the definition of 'resource recovery' is inclusive and flexible to accommodate alternative uses.

### *An increased role for complementary measures*

Historically, SA has been able to achieve nation-leading diversion rates while maintaining a relatively low Levy. SA's success can, in part, be traced back to its active history of policies and programs that support the 'zero-waste' initiative. The standout performer here is SA's CDL, but there were also a number of other complementary measures identified in the consultation process that play an important role here as well.

The intention of a tax to correct an externality, such as pollution, is that it provides incentives to change behaviour and hence reduce the negative externality. However, an issue raised during the review was that a large proportion of waste generators, namely households and small businesses, do not have adequate incentives to change their behaviour. This is such, since on an individual basis many households and small businesses do not generate large amounts of waste and therefore do not have large costs with waste generation. Since these sectors contribute significantly to the amount of waste generated then this has important ramifications for the level of waste sent to landfill.

Whereas the Levy appears to have its limitations — particularly in the short run — there may be scope to improve diversion by pursuing additional complementary measures. A number of such measures were raised in the consultation process, and include:

- education campaigns and information provision aimed in particular at households and small and medium enterprises;
- incentives to encourage source separation in the commercial and industrial sectors; and
- support to promote on-site treatment of C&D waste.

These measures would help to overcome diminishing returns in resource recovery.

In a similar vein, market-support mechanisms might also be considered to support the resource recovery efforts. Such programs might include[15]:

- requiring that major public sector infrastructure projects (such as roads and major developments) use a given proportion of recycled materials in their processes;
- that manufacturing and business processes strive achieve performance targets defined around their use of recycled materials; and
- providing the infrastructure necessary to allow for landfills to take advantage of waste-to-energy opportunities.

Notably, some care should be taken with this latter set of measures to ensure that market principles are not interfered with in a way that creates for poor and distortionary incentives.

### *Interactions with a price on carbon*

The modelling undertaken has incorporated the impact of the carbon price mechanism. The costs of the carbon pricing mechanism to businesses, Local Government and households have not been included in the assessment of the Levy's costs on these stakeholders. This is such, as the carbon pricing mechanism will be charged in addition to the Solid Waste Levy.

However, if the Levy has been applied to account for the environmental and social impact of landfill — including GHG — then the Levy and the carbon price appear to be 'correcting' the same cost. That is, landfill would be taxed twice.

It follows then, that the Levy should be reduced (or the carbon price not applied to landfill) to account for this double counting.

### *Long term planning*

In principle, the Levy is designed to produce a market signal throughout the SA economy that is reflective of the true costs of waste. This market signal works best when the economy has the capacity and capability to respond and invest in alternative practices. Contracts are often written for periods of three or more years in advance — further limiting the economy's ability to respond to price signals.

[15] It is noted that the provision of these programs may be outside the scope of ZWSA.

If future increases in the Levy were to be flagged well in advance it would give the sector and its consumers the opportunity to invest in practices in a pragmatic way. It was suggested in the consultations that increases in the Levy be included in a long-term strategic plan — that included industry and other key sectors.

*Appendix A*

# Terms of Reference

Describe and quantify the impacts and influence the increases in the levy will have over the period on:

- Landfill operators
  - including future landfill capacity servicing metropolitan Adelaide, gate price.
- The recycling industry – across all material streams
  - consider factors such as source separation, sorting, infrastructure investment, strategic planning, performance of recycling/resource recovery, market development potential, competition for source materials (e.g. organics), operators sensitive to global markets (e.g. metal recyclers);
  - include discussion on gate price and/or purchase price for inputs, stockpiling of 'feedstock', residuals management, expense avoidance activity, stockpiling of processed resources, investment decisions, jobs creation.
- The waste to energy sector
  - including potential competition between energy from waste markets and material markets (including competition for source materials between different resource recovery operators and impact on existing operators/jobs/investment).
- Alternative to landfill waste technologies (AWTs)
  - the likelihood and feasibility of establishing AWTs due to increases in levy;
  - appropriate price points;
  - subsequent effect of established AWTs on waste disposal, recycling and resource recovery;
  - Net financial benefits (if any) realisable by local government and industry through adoption of alternatives to landfill (or not).
- Local government (metropolitan and non-metropolitan)
  - current waste management costs per household and future per household costs associated with increases in the levy;
  - potential for further diversion from 3-bin system that does not recycle food waste;
  - potential for further diversion from 3-bin system kerbside collection systems that does recycle food waste;
  - potential for further diversion from 3-bin system through the use of alternative collection frequencies;

  - implications for councils using split-bin (waste / recycling) systems;
  - management and disposal of hard waste;
  - illegal dumping and the associated costs (e.g. clean up, education and awareness, enforcement);
  - regionalisation of non-metropolitan landfills and transfer stations;
  - consideration of other methods for calculating Levies paid by non-metropolitan councils.

- State government
  - potential for increased illegal waste disposal (illegal landfilling and illegal dumping) and associated costs to manage, investigate and enforce;
  - potential for increased rorting of levy payments, and the need (and associated costs) for increased auditing capacity and capability;
  - additional responsibilities and costs (e.g. licensing, data collection and management, auditing and monitoring, enforcement).
- Business and industry
  - especially small to medium enterprises;
  - potential incentives / disincentives for waste avoidance/reduction, resource efficiency, source separation.
- Households
  - per annum financial effect on ratepayers (assume continuation of high performing source separation systems).
- Charitable organisations

*Appendix B*

# Consultation process

In-depth consultations with industry, business, local government and other relevant stakeholders have informed this study. The insights provided through these consultations provided a key source of data for the review. All stakeholders were encouraged to speak openly and honestly, with their views kept confidential. A list of the organisations consulted is provided in Table B.1.

Table B.1

**STAKEHOLDER CONSULTATIONS**

| Sector | Organisation |
|---|---|
| Industry | Waste Management Association of Australia (SA Branch) |
| | Australian Industry Group |
| | Integrated Waste Services |
| | Business SA |
| | Veolia |
| | Sims Metal |
| | Australian Landfill Owners Association |
| | Jeffries |
| | TransPacific |
| | Wastecare SA |
| SA Government | EPA |
| | ZWSA |
| Local Government | Local Government Association South Australia |
| | Adelaide City Council |
| | Fleurieu Regional Waste Authority |
| | Campbelltown City Council |
| | Barossa Council |
| | City of Norwood Payneham & St Peters |
| | City of West Torrens |
| | Tea Tree Gully Council |
| | City of Burnside |
| | Adelaide Hills Region Waste Management Authority |
| | Onkaparinga City Council |
| | City of Marion |
| | Southern Regional Waste Resource Authority |
| Community | KESAB |
| | SA Conservation Council |

Source: Allen Consulting Group.

Consultations were undertaken in June and July 2011, and were conducted through a mix of face-to-face interviews, workshops and phone interviews.

*Appendix C*

# Defining a baseline case

The essence of impact assessment is to apply the with/without principle. This evaluation in essence asks: what is the difference in costs and benefits if the baseline case is implemented compared to the implementation of a different Scenario. In order to isolate the impacts arising from changes to the Levy, it is necessary to compare the differing changes with a reference Scenario representing the structure and quantum of the Levy that would have occurred without any policy change — the baseline case. This study examines the baseline case and compares it to four Scenarios, each with its own unique characteristics.

The baseline case estimates are based on the current Levy of $35 per tonne for metropolitan areas and $17 per tonne for non-metropolitan remaining at these base levels with the Levy only being increased to reflect CPI increases, as seen in the following table.

Table C.1

**BASELINE CASE LEVY, $**

| Region | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 |
|---|---|---|---|---|---|---|
| Metropolitan | MSW | 26.0 | 35.1 | 36.2 | 37.3 | 38.5 |
| | C&I | 26.0 | 35.1 | 36.2 | 37.3 | 38.5 |
| | C&D | 26.0 | 35.1 | 36.2 | 37.3 | 38.5 |
| Non metropolitan | MSW | 13.0 | 17.6 | 18.1 | 18.7 | 19.2 |
| | C&I | 13.0 | 17.6 | 18.1 | 18.7 | 19.2 |
| | C&D | 13.0 | 17.6 | 18.1 | 18.7 | 19.2 |

Source: The Allen Consulting Group

## C.1 Baseline waste generation

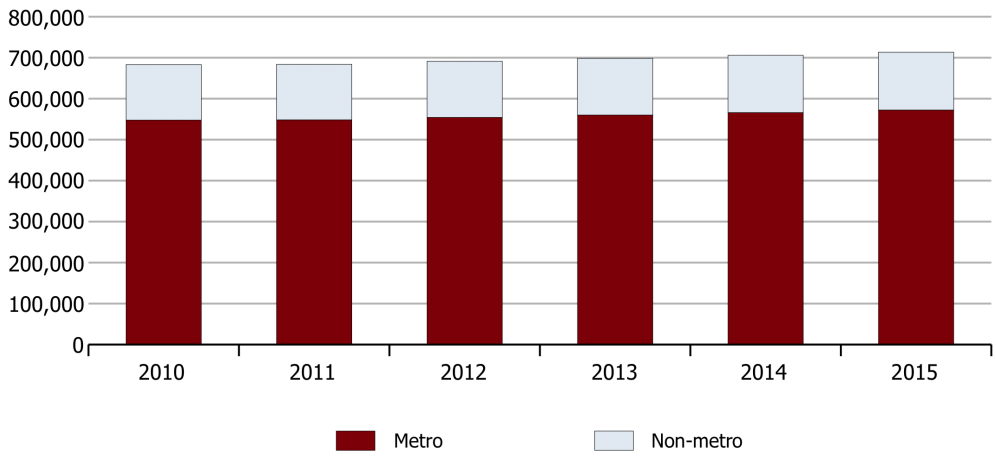
By 2014-2015, it has been estimated that SA will generate around 166 thousand more tonnes of waste than in 2010. This reflects an increase of about 4 per cent. How baseline waste generation differs by sector and region is discussed below.

Projections of MSW generation have been based on the relationship between the growth in SA households and waste generation. The historical trend between MSW growth and both metropolitan and non-metropolitan household growth has been projected to 2014-2015. The estimated household growth rates used in the analysis are based on ABS household projections (ABS 3236.0).

Estimates for household growth from the ABS have then been used to estimate the levels of MSW generated, as seen in Figure C.1. Waste generation by this sector, which is assumed to be unaffected by changes in the Levy, grows by around 1 per cent per year — increasing by around 30 thousand tonnes in total.

Figure C.1

**BASELINE CASE MSW WASTE GENERATION, TONNES**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

For both C&D and C&I, waste generation projections have been based on the relationship between waste generation in these sectors and gross state product (GSP). The historical trend between C&D and C&I and GSP has been projected to 2015 and used to determine C&D and C&I waste generation during this time.

Waste generation in the C&I and C&D sectors is expected to increase by 47 and 90 thousand tonnes respectively. That is, by 2015 the waste production by the C&I and C&D sectors is expected to be approximately 4 per cent greater than in 2015.

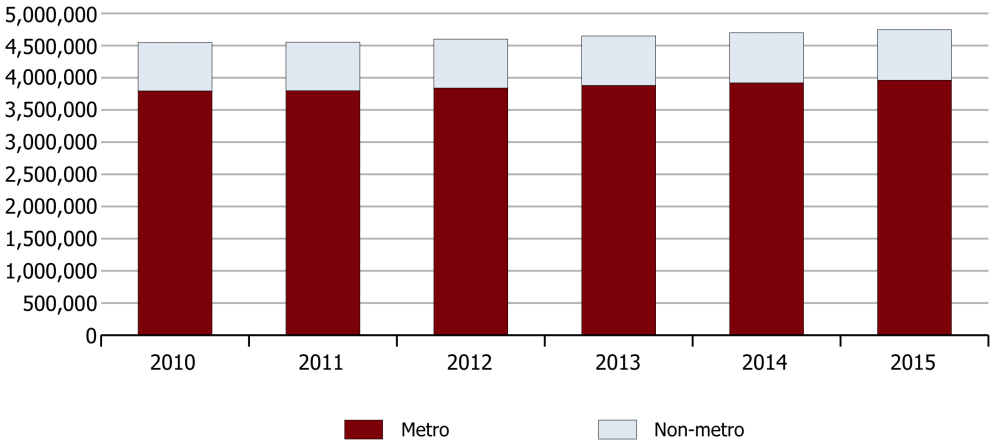
Historically, the vast majority of waste — approximately 78 per cent — is generated in metropolitan Adelaide.

Unfortunately, the available data is unable to identify how waste generation differs on a regional basis. For the purposes of this exercise then, it has been assumed that this ratio is consistent across all sectors. It should be noted that this might lead to an overestimation of the level of C&I and C&D waste in non-metropolitan areas as it is anticipated that waste generation for these sectors would be proportionally higher in metropolitan areas.

The base-case estimates for waste generation by region are illustrated in Figure C.2. By 2015, metropolitan areas are estimated to generate an additional 134 thousand tonnes than they did in 2010; and an additional 33 thousand tonnes in non-metropolitan areas. Estimates for both sectors are portrayed in Figure C.2.

Figure C.2

**BASELINE CASE WASTE GENERATION BY REGION, TONNES**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

## C.2 Baseline recycling

Previous changes in the Levy and their effect on the amount of waste going to landfill can be used to provide estimates about the impact of future Levy changes on the amount of waste sent to landfill.

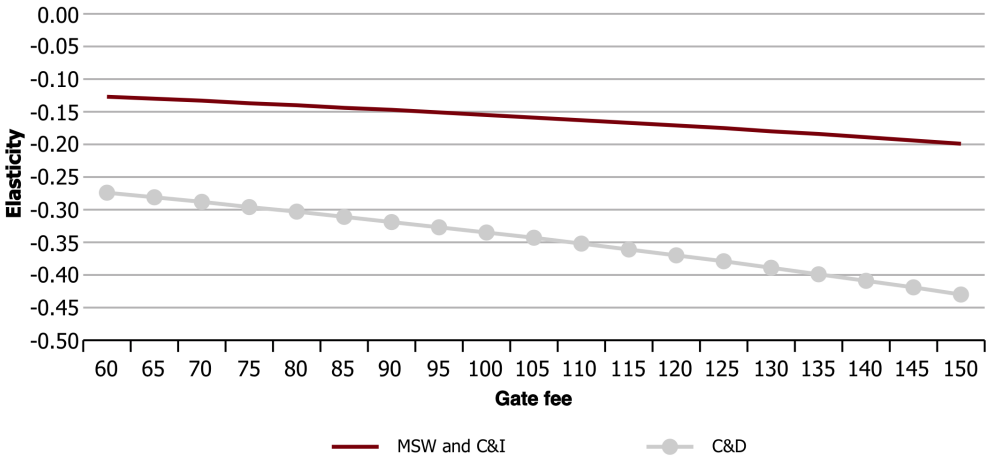
The responsiveness of the amount of waste sent to landfill to rises in the Levy is known as the price elasticity (or simply elasticity). Elasticity is a measure of the proportional change in quantity that occurs from a given proportional change in price. It is generally reported as a negative number (reflecting the fact that price increases cause the quantity demanded to fall).

MMA and BDO Group (2007) estimated the elasticity of waste for different sectors across the economy in 2007, ranging between -0.13 for MSW and C&I to -0.3 for C&D. Generally speaking, while measures of elasticity are specific to a particular price point, they remain reasonable estimate for small changes in price around that point. The difficulty here however, is that prices have grown substantially since that analysis and these estimates may no longer be close approximations.

Using the MMA and BDO Group estimates as a staring point, a series of functions were was estimated relating elasticity to gate prices (inclusive of the Levy, CPM and GST) for MSW, C&I and C&D. These functions are presented in Figure C.3.

Figure C.3

**ELASTICITY AND GATE PRICE (INCLUSIE OF LEVIES AND TAXES)**



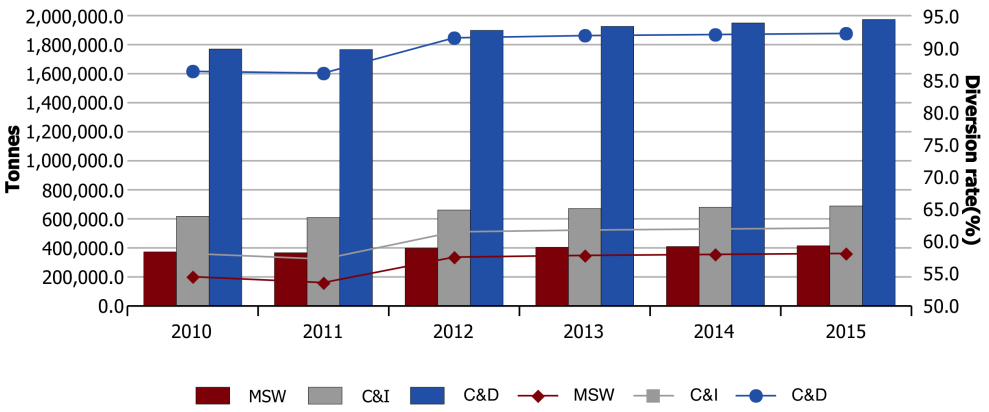

Source: The Allen Consulting Group, based on MMA and BDO (2007).

The elasticity functions illustrated in the figure above have been used to estimate how the SA economy responds to changes in the Levy in the baseline (and in various scenarios). Recognising stakeholder comments on the relative 'stickiness' of waste management, these elasticities were subjected to a 'response factor', which increased over time. The assumed response factor started at 0.5 for MSW and C&I, and 0.2 for C&D (reflecting the fact that the C&D sector already had a very high diversion rate). The factor then grew by 0.1 year on year for all sectors.

The elasticity measures, combined with anticipated changes in the Levy, allow for estimates of anticipated changes in the diversion rate and the amount of waste recycled. These estimates are reported by sector in Figure C.4 and by region in Figure C.5.

Figure C.4

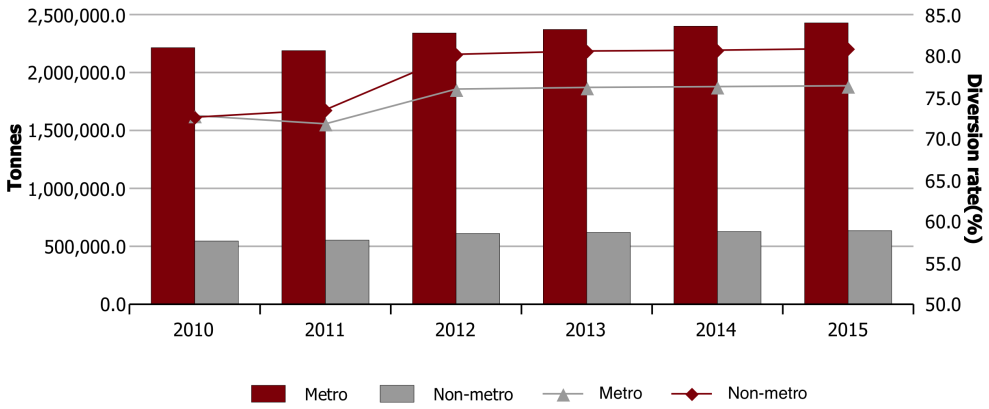
**BASELINE RECYCLING AND DIVERSION, BY SECTOR**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

Figure C.5

**BASELINE RECYCLING AND DIVERSION, BY REGION**



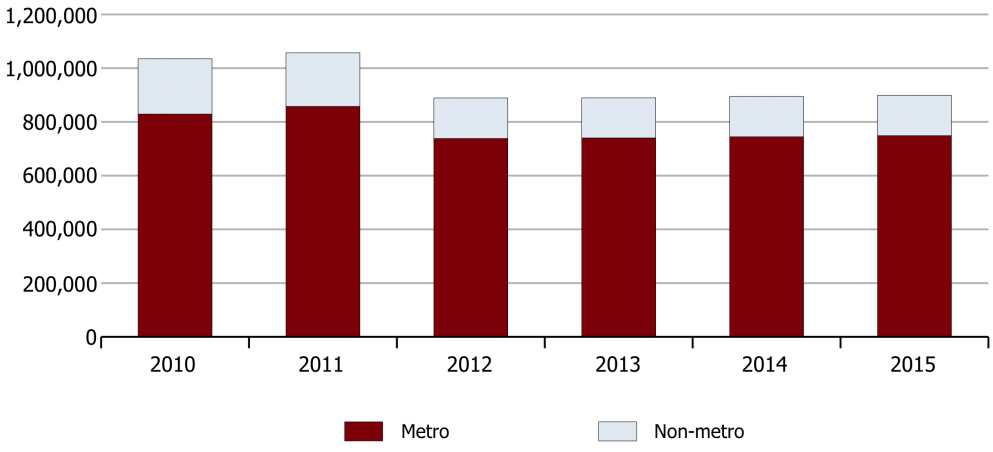

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

## C.3 Baseline landfill

The amount of waste sent to landfill will be calculated based on the methodology outlined above. Baseline estimates of landfill by region are reported in Figure C.6. These estimates are the residual waste when recycling is taken from waste generation. As recycling increases, landfill declines.

Figure C.6

**BASELINE LANDFILL, TONNES**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

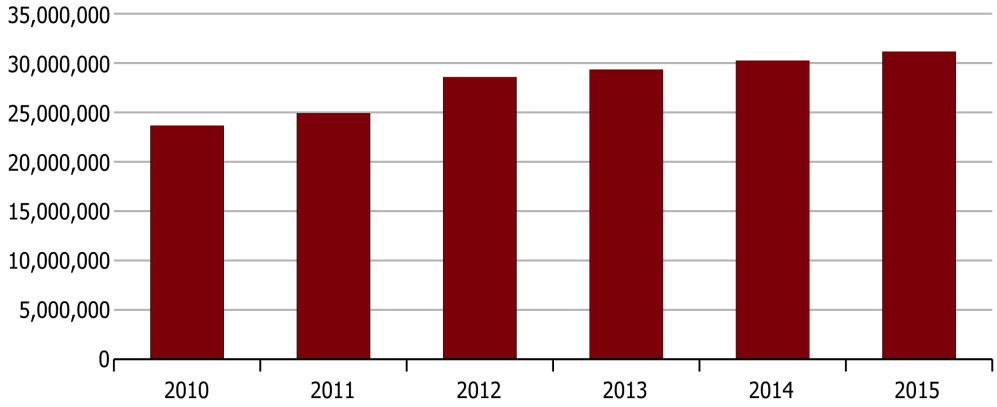
## C.4 Baseline Levy revenue

Estimations about the amount of waste sent to landfill can be used to compute the varying revenue levels generated from differing Levy amounts, including the total revenue generated, as well as the amount of revenue deposited to the Waste to Resources Fund.

The estimates for revenue generated in the baseline case are illustrated in Figure C.7. By 2015, the Levy is expected to generate some $31.1 million, up from $23.6 million collected in 2010.

Figure C.7

**BASELINE CASE REVENUES, $**




Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

*Appendix D*

# Change scenarios

To illustrate the impacts of alternative applications of the Levy, this study has assessed four alternative Scenarios. Each Scenario contains differences in the Levy or other influential changes as outlined in Table D.1. This table outlines the Levy amounts in 2013-14 as this is when all the significant increases in the Levy take effect. After 2013-14 increases are in line with CPI.

Table D.1

**SCENARIOS**

| Scenario | Description | Value of Levy in 2013-14, $ | | | | | |
|---|---|---|---|---|---|---|---|
| | | Metropolitan Adelaide | | | Non-metropolitan Adelaide | | |
| | | MSW | C&I | C&D | MSW | C&I | C&D |
| Baseline case | Maintain the current Levy and increase with CPI | 37.3 | 37.3 | 37.3 | 18.7 | 18.7 | 18.7 |
| Scenario 1 | General Levy | 50.0 | 50.0 | 50.0 | 25.0 | 25.0 | 25.0 |
| Scenario 2 | A differential Levy for the key waste generating sectors. | 37.3 | 50.0 | 50.0 | 18.7 | 25.0 | 25.0 |
| Scenario 3 | A differential Levy applied on the basis of location. | 50.0 | 50.0 | 50.0 | 18.7 | 18.7 | 18.7 |
| Scenario 4 | Increase the Levy, plus change levy administration | 50.0 | 50.0 | 50.0 | 25.0 | 25.0 | 25.0 |

Source: The Allen Consulting Group

Levy rates under each Scenario from 2010-2111 to 2014-2015 are outlined below.

## D.1 Scenario 1 — General Levy increase

Scenario 1 assesses the impacts of a step increase in the Levy across all sectors in 2013-14. Specifically, it analyses the effects of the following Levy changes in 2013-14:

- **Metropolitan Adelaide** — increasing the Levy for all sectors to $50.
- **Non-metropolitan Adelaide** — increasing the Levy for all sectors to $25.

The Levy is continuously increased to reflect CPI increases for all sectors. In 2013-14 the Levy is increased outside of CPI changes in metropolitan Adelaide and non-metropolitan Adelaide.

## D.2 Scenario 2 — Differential Levy by sector

This Scenario involves assessing the impact of applying a differential levy by waste sector. Specifically, it analyses the effects of the following Levy changes in 2013-14:

- **MSW** — maintaining the Levy at $35 per tonne (+ CPI) in metropolitan areas and $17.50 per tonne (+ CPI) for MSW;
- **C&D And C&I —** increasing the Levy for the C&D and C&I sectors to $50 in metropolitan areas and $25 in non-metropolitan areas

The Levy is continuously increased to reflect CPI increases for all sectors. Additionally, in 2013-2014 the Levy is increased outside of CPI changes in the C&D and C&I sectors.

This Scenario also involves a discussion of the sectoral and geographical impacts that would be associated with an (50-100 per cent) increase in the amount of the Levy charged for contaminated soil in addition to the Levy changes outlined above.

### D.3 Scenario 3 — Differential Levy by location

Scenario 3 involves assessing the impact of applying a differential Levy by geographical location. Specifically, it analyses the effects of the following Levy changes in 2013-14:

- **Metropolitan Adelaide** — increasing the Levy for all sectors to $50 per tonne.
- **Non-metropolitan Adelaide** — maintaining the Levy for all sectors at $17.50 per tonne (+ CPI).

The levy is continuously increased to reflect CPI increases for both areas. Additionally, in 2013-2014 the levy is increased outside of CPI changes in metropolitan Adelaide.

The analysis of this Scenario also includes a discussion of the impact of the establishment of a new geographical sector – 'Major Regional Centres'. This discussion would examine the impact of metropolitan Levy increases to $50 per tonne in 2013-2014, with a major regional centre Levy of $17.50 (+ CPI) and the remaining regional areas charged $10, $5 or $0 per tonne.

### D.4 Scenario 4 — Rebate scheme

Scenario 4 involves Levy changes identical to that of Scenario 1, but includes a change in how the Levy is administered. Under this scenario, transfer stations would be required to collect a levy on all waste received. A rebate for all recycling and recovery (actual sales) would then provided.

As with Scenario 1, the Levy changes for 2013-14 here will be:

- **Metropolitan Adelaide** — increasing the Levy for all sectors to $50.
- **Non-metropolitan Adelaide** — increasing the Levy for all sectors to $25.

Following consultations with stakeholders, it is not expected that this scenario will produce a material difference to resource recovery in the state.

The administrative change principally affects when the Levy is collected — but not the overall amount. To this end then, the key impact of this scenario will see a redistribution of working capital.

*Appendix E*

# Quantifying the impacts

This appendix outlines the basis for, and methods used, to quantify the market impacts of each Scenario, which were then used to estimate the net impacts of each Scenario.

## E.1 The market impact of diverting a tonne of waste from landfill to resource recovery

The market impact of diverting a tonne of waste from landfill to resource recovery is based on the increase cost of this diversion. Since increasing the Levy induces additional volumes of waste to be sent to resource recovery, and resource recovery has a greater market cost than landfill, the market cost of diverting a tonne of waste from landfill to resource recovery leads to increased economic costs (see Box E.1).

However, it should be noted that this does not take into account the economic impact of environmental benefits. Hence, the overall economic cost considers the market cost of diverting waste as well as the environmental benefit.

The market impacts projected for the recycling sector are based on an average cost of recovery around $95 per tonne. This figure was calculated by:

- first summing the total income from sales of recyclable or recoverable material and the other sources of income, including income from energy, generated from waste (ABS 8698.0); and
- second dividing this figure by the tonnes of recycling in SA in 2010 to establish the per tonne cost of recycling.

Box E.1

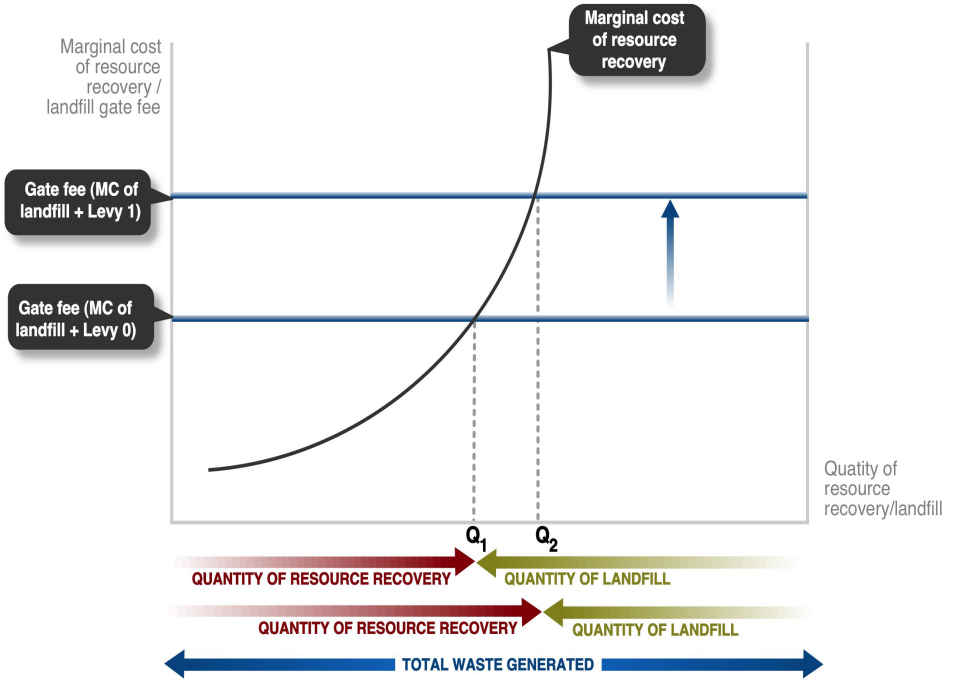
**THE MARKET IMPACT OF DIVERTING A TONNE OF WASTE FROM LANDFILL TO RESOURCE RECOVERY**

Generally, resource recovery requires a higher market cost than sending waste to landfill. This is such, as the marginal cost, or the cost of sending an additional tonne of waste to resource recovery is higher than the marginal cost of sending it to landfill. Hence, with increases in the Levy, more resource recovery occurs, but this is done at a greater cost, as outlined in the Figure below.

The Figure shows that an increase in the Levy, from Levy 0 to Levy 1, increases the gate fee charged for landfill. This increase leads to a lesser amount of waste being sent to landfill as illustrated by the movement from Q1 to Q2.

The also figure also shows that the marginal cost of resource recovery increases with greater quantities of waste. This is so, since to process increased volumes of waste, higher cost technologies are required. This increases the cost of sending additional waste to resource recovery and leads to maket costs.

While there may be some economies of scale present in the resource recovery sector, these are unlikely to be realised in the short to medium term.




Source: The Allen Consulting Group

With changes to the Levy under the differing Scenarios, the model has been used to estimate the differing gate prices charged for resource recovery under each Scenario. These have then been used to calculate the economic cost of sending waste to resource recovery. Under a carbon price, it would be anticipated that the average cost of recovery would increase, since the higher cost to send waste to landfill would mean that higher cost technologies would become viable and hence be used in the recovery process.

It is assumed that the revenue per tonne of recovered resources, takes account of all the community wide costs, which allows a calculation of the economic costs of differing volumes of resource recovery.

The economic cost of the differing Scenarios is outlined in Table E.1. Scenarios 1 and 4 have the greatest economic cost, a reflection of the fact that these Scenarios have the greatest impact on the volume of resource recovery. Scenarios 2 and 3 have relatively similar economic impacts.

Table E.1

**ECONOMIC IMPACT, DEVIATION FROM BASELINE ($, MILLION)**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Scenario 1 | 6.0 | 6.2 |
| Scenario 2 | 5.3 | 5.4 |
| Scenario 3 | 5.0 | 5.1 |
| Scenario 4 | 6.0 | 6.2 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

The economic cost savings of the differing Scenarios is outlined in Table E.2. Scenarios 1 and 4 have the greatest economic saving in 2014-15, a saving of $5.4 million. This is a reflection of the fact that these Scenarios have the greatest impact on the volume of waste to landfill. Scenarios 2 and 3 produce similar economic cost savings of $4.5 and $4.4 million respectively.

Table E.2

**COST SAVINGS FROM AVOIDED LANDFILL, DEVIATION FROM BASELINE ($, MILLION)**

| Scenario | 2013-14 | 2014-2015 |
|---|---|---|
| Scenario 1 | 5.2 | 5.4 |
| Scenario 2 | 4.4 | 4.5 |
| Scenario 3 | 4.3 | 4.4 |
| Scenario 4 | 5.2 | 5.4 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group

Notably, the costs of recovery are greater than the cost savings from avoided landfill — despite the quantities being the same. This is such since resource recovery is economically a more expensive mechanism of managing waste than sending waste to landfill.

Demand increases in the resource recovery sector raise the value of the recovery process. The set of viable technologies and methods also increases as a result. While this may benefit some sectors of the industry, it is important to remember that resource recovery is a higher cost process for waste management — and that this cost is borne by the community. Additionally, the marginal cost of resource recovery (or the additional cost for each unit of resources recovered) increases with each additional unit of waste recovered, as shown in Box E.1. This is such, as the expense associated with recovering additional quantities increases given current technologies, as more expensive technologies start to be used in the recovery process.

## E.2 Quantifying the environmental impacts

By diverting waste away from landfill, increases in the Levy are able to achieve some considerable environmental benefits. Where possible, the environmental benefits resulting from changes to the Levy have been quantified. Reductions in GHG emission, dis-amenity, leachate and airborne emissions have been quantified for this study. However, the benefits associated with the preservation of natural resource and other externalities, such as transport externalities have not being quantified in this study.

The value of the quantified environmental benefits is presented in the table below for each of the scenarios. Benefits are reported relative to the baseline case, and show the additional gains that could be achieved. These benefits have been calculated by applying the following estimates of landfill avoidance to the expected decrease in waste to landfill generated under each scenario.

- **Disamentity** — $4.09 per tonne of landfill.
- **Leachate** — $0.1 per tonne of landfill sourced from the C&D sector.
- **Airborne emissions** (other than GHG) — $0.98 per tonne of landfill soured from MSW and C&I sectors, and $0.68 per tonne of landfill sourced from C&D.
- **GHG emissions** — valued at $23 per tonne of $CO_2$-e with given estimated GHG emission factors as outlined in Table E.3.

Table E.3

**ADDITIONAL COSTS ASSOCIATED WITH A CARBON PRICE, 2011**

| Waste Sector | Emissions per tonne, CO2-e/t | Carbon Price $ | Average cost* $ |
|---|---|---|---|
| MSW | 1.2 | 23 | 16.42 |
| CI | 1.1 | 23 | 14.90 |
| CD | 0.2 | 23 | 2.35 |

*The average cost had been adjusted based on the net amount of liable landfill emissions, recognising the effects of capping. It also includes the effect of landfill methane loss and the methane released before waste emissions are capped.
Source: Stakeholder consultations and data, Allen Consulting Group analysis.

The value of avoided landfill is outlined in Table E.4. Scenarios 1 and 4 have the greatest value, a reflection of the fact that under these Scenarios the greatest amount of waste is diverted from landfill.

Table E.4

**VALUE OF ENVIRONMENTAL BENEFITS, $MILLION**

| Scenario | 2013-14 | 2014-15 |
|---|---|---|
| Scenario 1 | 0.6 | 0.6 |
| Scenario 2 | 0.4 | 0.4 |
| Scenario 3 | 0.5 | 0.5 |
| Scenario 4 | 0.6 | 0.6 |

Note: The baseline includes the impacts of the CPM, deviations reported are the specific consequence of changes in the Levy.
Source: The Allen Consulting Group.

*Appendix F*

# Assumptions used in the analysis

The key assumptions underpinning the analysis contained in this report are outlined in Table F.1.

Table F.1

**KEY ASSUMPTIONS USED IN THE ANALYSIS**

| Assumption | Value used | Notes |
|---|---|---|
| Number of jobs per ten thousand tonnes of waste | | |
| Landfill | 2.8 | This figure has been used from information contained in the *National Waste Report 2010* (see DEWHA 2010). |
| Resource recovery | 9.2 | |
| Emission factors | | |
| MSW | 0.2 | Data provided by ZWSA, based on the *National Waste Report 2010* (see DEWHA 2010). |
| C&I | 1.1 | |
| C&D | 1.2 | |
| Per cent of emissions covered by CPM | 60 per cent | ZWSA |
| Elasticity measures | | |
| MSW | na | Based on MMA and BDA Group, *South Australia Waste Strategy 2005-2010: Ex-ante Benefit Cost Assessment*, p. 32. Functional forms estimated and reported in Figure C.3. |
| C&I | na | |
| C&D | na | |
| Percentage of landfill by sector, 2010-11 | | |
| MSW | 30 | National Waste Report 2010. |
| C&I | 43 | |
| C&D | 27 | |
| Baseline diversion rate by sector, 2010-11 | | |
| MSW | 0.52 | The Allen Consulting Group calculated these rates using available data and information. |
| C&I | 0.72 | |
| C&D | 0.80 | |

| Assumption | Value used | Notes |
|---|---|---|
| Gate price per tonne of waste, 2010-11 | | |
| Landfill | $90 | These figures was calculated by:<br>• first summing the total income from sales of recyclable or recoverable material and the other sources of income, including income from energy, generated from waste (ABS 8698.0); and<br>• second dividing this figure by the tonnes of recycling in SA in 2010 to establish the per tonne cost of recycling. |
| Resource recovery | $95 | |
| Number of households in SA, 2010 | | |
| Metropolitan households | 481,112 | Data obtained from data in *Household and Family Projections, Australia, 2006 to 2031*. ABS Cat No 3236.0. |
| Non-metropolitan households | 176,901 | |
| Gross State Product, 2010 | | |
| GSP, $ million | 86,653 | Data calculated based on information in *Australian National Accounts: National Income, Expenditure and Product, Table 25. State Final Demand, Detailed components: South Australia,* ABS Cat No 5206.0. |
| Inflation | | |
| Indexation factor, per cent | 3.1 | SA Department of Treasury and Finance |
| Number of businesses in SA, 2008-09 | | |
| Non-employing | 92393 | Data obtained from *Counts of Australian Businesses, including Entries and Exits, Jun 2007 to Jun 2009*, ABS Catalogue Number 8165.0 |
| 1-19 employees | 46327 | |
| 20-199 employees | 5739 | |
| 200+ employees | 418 | |
| Total | 144877 | |

Source: Allen Consulting Group analysis

*Appendix G*

# Detailed data tables

This Appendix outlines the projections discussed in the analysis in the report.

## G.1 Summary tables

Table G.1

**OVERALL IMPACT**

| | 2014 | 2015 |
|---|---|---|
| **Landfill ('000 Tonnes)** | | |
| Baseline | 882 | 885 |
| S1_50 | 826 | 826 |
| S2_sector | 835 | 835 |
| S3_regional | 830 | 830 |
| S4_rebate | 826 | 826 |
| **Recoverable ('000 Tonnes)** | | |
| Baseline | 3039 | 3077 |
| S1_50 | 3095 | 3136 |
| S2_sector | 3086 | 3127 |
| S3_regional | 3091 | 3132 |
| S4_rebate | 3095 | 3136 |
| **Diversion rate (%)** | | |
| Baseline | 77.50 | 77.70 |
| S1_50 | 78.90 | 79.20 |
| S2_sector | 78.70 | 78.90 |
| S3_regional | 78.80 | 79.10 |
| S4_rebate | 78.90 | 79.20 |
| **Revenues ($ million)** | | |
| Baseline | 30.2 | 31.2 |
| S1_50 | 37.7 | 38.8 |
| S2_sector | 34.7 | 35.7 |
| S3_regional | 36.9 | 38.0 |
| S4_rebate | 37.7 | 38.8 |

Source: The Allen Consulting Group

Table G.2

**OVERALL DIFFERENCE FROM BASELINE**

| | 2014 | 2015 |
|---|---|---|
| **Landfill ('000 Tonnes)** | | |
| Baseline | 0.0 | 0.0 |
| S1_50 | -56.8 | -59.6 |
| S2_sector | -47.8 | -50.2 |
| S3_regional | -52.6 | -55.4 |
| S4_rebate | -56.8 | -59.6 |
| **Recoverable ('000 Tonnes)** | | |
| Baseline | 0 | 0 |
| S1_50 | 56.8 | 59.6 |
| S2_sector | 47.8 | 50.2 |
| S3_regional | 52.6 | 55.4 |
| S4_rebate | 56.8 | 59.6 |
| **Diversion rates (per cent)** | | |
| Baseline | 0.0 | 0.0 |
| S1_50 | 1.4 | 1.5 |
| S2_sector | 1.2 | 1.3 |
| S3_regional | 1.3 | 1.4 |
| S4_rebate | 1.4 | 1.5 |
| **Revenues ($ million)** | | |
| Baseline | 0.0 | 0.0 |
| S1_50 | 7.5 | 7.7 |
| S2_sector | 4.5 | 4.5 |
| S3_regional | 6.7 | 6.8 |
| S4_rebate | 7.0 | 7.7 |

Source: The Allen Consulting Group

## G.2 Landfill

Table G.3

**LANDFILL, TONNES**

| | 2014 | 2015 |
|---|---|---|
| **Metropolitan** | | |
| Baseline | 734754 | 736567 |
| S1_50 | 682196 | 681308 |
| S2_sector | 689897 | 689028 |
| S3_regional | 682196 | 681308 |
| S4_rebate | 682196 | 681308 |
| **Non-metropolitan** | | |
| Baseline | 147700 | 148647 |
| S1_50 | 143438 | 144309 |
| S2_sector | 144730 | 145946 |
| S3_regional | 147649 | 148552 |
| S4_rebate | 143438 | 144309 |
| **MSW** | | |
| Baseline | 296556 | 298648 |
| S1_50 | 287249 | 288911 |
| S2_sector | 295886 | 298345 |
| S3_regional | 288836 | 290510 |
| S4_rebate | 287249 | 288911 |
| **C&I** | | |
| Baseline | 417972 | 420505 |
| S1_50 | 402510 | 404334 |
| S2_sector | 402866 | 404335 |
| S3_regional | 405134 | 406978 |
| S4_rebate | 402510 | 404334 |
| **C&D** | | |
| Baseline | 167926 | 166060 |
| S1_50 | 135875 | 132372 |
| S2_sector | 135875 | 132295 |
| S3_regional | 135875 | 132372 |
| S4_rebate | 135875 | 132372 |

Source: The Allen Consulting Group

Table G.4

**LANDFILL DIFFERENCE FROM BASELINE, TONNES**

| | 2014 | 2015 |
|---|---|---|
| **Metropolitan** | | |
| Baseline | 0 | 0 |
| S1_50 | -52559 | -55259 |
| S2_sector | -44858 | -47539 |
| S3_regional | -52559 | -55259 |
| S4_rebate | -52559 | -55259 |
| **Non-metropolitan** | | |
| Baseline | 0 | 0 |
| S1_50 | -4261 | -4339 |
| S2_sector | -2970 | -2701 |
| S3_regional | -50 | -95 |
| S4_rebate | -4261 | -4339 |
| **MSW** | | |
| Baseline | 0 | 0 |
| S1_50 | -9307 | -9738 |
| S2_sector | -671 | -304 |
| S3_regional | -7720 | -8139 |
| S4_rebate | -9307 | -9738 |
| **C&I** | | |
| Baseline | 0 | 0 |
| S1_50 | -15462 | -16172 |
| S2_sector | -15106 | -16171 |
| S3_regional | -12838 | -13527 |
| S4_rebate | -15462 | -16172 |
| **C&D** | | |
| Baseline | 0 | 0 |
| S1_50 | -32051 | -33689 |
| S2_sector | -32051 | -33766 |
| S3_regional | -32051 | -33689 |
| S4_rebate | -32051 | -33689 |

Source: The Allen Consulting Group

## G.3 Recovered materials

Table G.5

**RECOVERED MATERIALS, TONNES**

| | 2014 | 2015 |
|---|---|---|
| **Metropolitan** | | |
| Baseline | 2409368 | 2440338 |
| S1_50 | 2461927 | 2495597 |
| S2_sector | 2454226 | 2487877 |
| S3_regional | 2461927 | 2495597 |
| S4_rebate | 2461927 | 2495597 |
| **Non-metropolitan** | | |
| Baseline | 629264 | 636417 |
| S1_50 | 633525 | 640756 |
| S2_sector | 632234 | 639118 |
| S3_regional | 629314 | 636513 |
| S4_rebate | 633525 | 640756 |
| **MSW** | | |
| Baseline | 409357 | 414810 |
| S1_50 | 418665 | 424548 |
| S2_sector | 410028 | 415114 |
| S3_regional | 417077 | 422949 |
| S4_rebate | 418665 | 424548 |
| **C&I** | | |
| Baseline | 679892 | 688742 |
| S1_50 | 695353 | 704914 |
| S2_sector | 694998 | 704913 |
| S3_regional | 692730 | 702269 |
| S4_rebate | 695353 | 704914 |
| **C&D** | | |
| Baseline | 1949383 | 1973203 |
| S1_50 | 1981434 | 2006892 |
| S2_sector | 1981434 | 2006969 |
| S3_regional | 1981434 | 2006892 |
| S4_rebate | 1981434 | 2006892 |

Source: The Allen Consulting Group

## G.4 Diversion rates

Table G.6

**DIVERSION RATES, PER CENT**

| | 2014 | 2015 |
|---|---|---|
| **Metropolitan** | | |
| Baseline | 76.6 | 76.8 |
| S1_50 | 78.3 | 78.6 |
| S2_sector | 78.1 | 78.3 |
| S3_regional | 78.3 | 78.6 |
| S4_rebate | 78.3 | 78.6 |
| **Non-metropolitan** | | |
| Baseline | 81.0 | 81.1 |
| S1_50 | 81.5 | 81.6 |
| S2_sector | 81.4 | 81.4 |
| S3_regional | 81.0 | 81.1 |
| S4_rebate | 81.5 | 81.6 |
| **MSW** | | |
| Baseline | 58.0 | 58.1 |
| S1_50 | 59.3 | 59.5 |
| S2_sector | 58.1 | 58.2 |
| S3_regional | 59.1 | 59.3 |
| S4_rebate | 59.3 | 59.5 |
| **C&I** | | |
| Baseline | 61.9 | 62.1 |
| S1_50 | 63.3 | 63.5 |
| S2_sector | 63.3 | 63.5 |
| S3_regional | 63.1 | 63.3 |
| S4_rebate | 63.3 | 63.5 |
| **C&D** | | |
| Baseline | 92.1 | 92.2 |
| S1_50 | 93.6 | 93.8 |
| S2_sector | 93.6 | 93.8 |
| S3_regional | 93.6 | 93.8 |
| S4_rebate | 93.6 | 93.8 |

Source: The Allen Consulting Group

## G.5 Revenues

Table G.7

**REVENUES, $**

| | 2014 | 2015 |
|---|---|---|
| **Metropolitan** | | |
| Baseline | 27413639 | 28333171 |
| S1_50 | 34109779 | 35121405 |
| S2_sector | 31402243 | 32311161 |
| S3_regional | 34109779 | 35121405 |
| S4_rebate | 34109779 | 35121405 |
| **Non-metropolitan** | | |
| Baseline | 2755332 | 2858975 |
| S1_50 | 3585961 | 3719557 |
| S2_sector | 3287130 | 3414191 |
| S3_regional | 2754392 | 2857141 |
| S4_rebate | 3066711 | 3719557 |
| **MSW** | | |
| Baseline | 10078483 | 10465514 |
| S1_50 | 13081229 | 13565269 |
| S2_sector | 10065973 | 10454397 |
| S3_regional | 12785665 | 13258951 |
| S4_rebate | 13081229 | 13565269 |
| **C&I** | | |
| Baseline | 14216574 | 14746638 |
| S1_50 | 18345272 | 18998394 |
| S2_sector | 18354161 | 18997623 |
| S3_regional | 17942385 | 18580987 |
| S4_rebate | 18345272 | 18998394 |
| **C&D** | | |
| Baseline | 5873915 | 5979995 |
| S1_50 | 6269239 | 6277300 |
| S2_sector | 6269239 | 6273332 |
| S3_regional | 6136121 | 6138608 |
| S4_rebate | 6269239 | 6277300 |

Source: The Allen Consulting Group

Table G.8

**REVENUES DIFFERENCE FROM BASELINE, $**

| | 2014 | 2015 |
|---|---|---|
| **Metropolitan** | | |
| Baseline | 0 | 0 |
| S1_50 | 6696140 | 6788234 |
| S2_sector | 3988603 | 3977990 |
| S3_regional | 6696140 | 6788234 |
| S4_rebate | 6696140 | 6788234 |
| **Non-metropolitan** | | |
| Baseline | 0 | 0 |
| S1_50 | 830629 | 860582 |
| S2_sector | 531797 | 555216 |
| S3_regional | -940 | -1835 |
| S4_rebate | 311378 | 860582 |
| **MSW** | | |
| Baseline | 0 | 0 |
| S1_50 | 3,002,746 | 3,099,755 |
| S2_sector | -12,510 | -11,116 |
| S3_regional | 2,707,182 | 2,793,438 |
| S4_rebate | 3,002,746 | 3,099,755 |
| **C&I** | | |
| Baseline | 0 | 0 |
| S1_50 | 4128698 | 4251756 |
| S2_sector | 4137587 | 4250985 |
| S3_regional | 3725811 | 3834348 |
| S4_rebate | 4128698 | 4251756 |
| **C&D** | | |
| Baseline | 0 | 0 |
| S1_50 | 395324 | 297305 |
| S2_sector | 395324 | 293337 |
| S3_regional | 262206 | 158613 |
| S4_rebate | 395324 | 297305 |

Source: The Allen Consulting Group

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